DATALOGIC

DATALOGIC AUTOMATION

EOX 10W

USER'S MANUAL

OCTOBER 2011

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SYMBOLS

The symbols used in this manual along with their meaning are shown below. The symbols are repeated within the chapters and/or sections and have the following meaning:

Generic warning:

This symbol indicates the need to read the manual carefully or the necessity of an important operation or maintenance.

Electricity warning:

This symbol indicates dangerous voltage associated with the laser, or powerful enough to constitute an electrical risk. This symbol may also appear on the machine at the risk area.

Laser warning:

This symbol indicates the danger of exposure to visible or invisible laser radiation. This symbol may also appear on the machine at the risk area.

Fire warning:

This symbol indicates the danger of a fire when processing flammable materials. Because there is a danger of fire, it is indispensable to follow the instructions provided by the manufacturer when commissioning the machine.

Note:

Refer to dedicated user's manual.

REVISION INDEX

Revision	Date	Number of added or edited pages
0.0	20-10-2011	Release

FOREWORD

The information contained in this manual is intended for a qualified installer capable of integrating the machine into a system, completing it with all protection systems required by international standards and local laws.

The following manual refers to the Eox 10W model, in CLASS 4 LASER configuration.

In addition to being professionally trained in their role, personnel assigned to work on the machine must be informed and made acquainted with the risks inherent invisible and visible laser radiation. The operator is required to carefully read the section of the manual concerning safety instructions as well as the sections related to matters falling under his responsibility.

The workers assigned to the machine can be identified as:

- **OPERATOR**
  responsible for loading elements to be processed, visually checking the work cycle, removing the finished product and cleaning the machine.

- **MAINTENANCE WORKER**
  responsible for the electrical, mechanical and optical maintenance and adjustment of the machine.

NOTE:
Datalogic Automation S.r.l. declines any and all responsibility for improper use of its device.

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE **APPENDICES**.

OVERVIEW

The CO_2 Eox 10W laser marking system developed and manufactured by Datalogic Automation employs the most advanced technologies with regards to the mechanical-optical part, the electronic control of laser beam power, communication and the overall safety of the entire system.

OPERATION OF A LASER SYSTEM WITH GALVANOMETRIC SCANNING

In pulsed or continuous operation mode, the CO_2 generates an invisible, high-energy infrared beam.
In order to obtain a more accurate focus, the laser beam is first enlarged by using an optical expansion system and then focused, after being deflected by a scanning system consisting of two mirrors mounted on galvanometric motors.
These mirrors deflect the beam in a controlled fashion along the X and Y axes; etching of the product surface occurs by coordinating the movement of the two motors with the turning on/off of the laser beam.

The deflected laser beam is focused by an F-Theta lens before it hits the surface of the product.
Generally speaking, the marking is carried out within the focus of the beam.

LASER SOURCE

A sealed gas laser tube is used in the Eox 10W system.
The tube contains a gas mixture (usually CO_2, N_2 and He) which is excited by a radiofrequency generator to bring it to a plasma state.
The produced radiations are reflected back and forth between the mirrors, which represent the “resonant laser cavity”; the laser beam is amplified with each reflection.
While one of the two mirrors (rear) is 100% reflectant, the output mirror (front) reflects only 95%; this slight loss of 5% represents the laser radiation used for etching purposes.

GALVANOMETRIC SCANNING HEAD

The scanning head features two deflection mirrors that deflect the beam in an X and Y direction, depending on the graphics to be reproduced.

NOTE:
Device installation in secure environment is responsibility of the system integrator!

The **Eox 10W** laser system is composed by a single device (All-In-One) with laser head and compact dimensions for an easy integration inside a complex system able to manage marking signals and customer's complementary modules.

All laser system connections are found on the back of device: supply input, controls and signals and interfaces for internal embedded controller. Moreover is available an inlet air to use to maintain clean the marking area thanks to holes around the focal lens.

Two side cooling belts are provided for cooling down the laser; their flow must never be obstructed.

Figure 1: Eox 10W Control Resonator.

INTENDED USE

The Eox 10W source is intended for the identification marking of organic and plastic materials and for the removal of coatings, paints and surface treatments from metals.

NOTE:

CO_2 marking systems mainly interact with materials through a thermal carbonization process with the emission of fumes and vapours.

Suitable methods for the treatment and abatement of marking fumes must be provided for, especially when working on plastic materials.

IMPORTANT WARNINGS

Access to the internal parts of the electrical equipment is allowed only to authorized personnel, duly qualified and trained with regards to risks of an electrical nature.
Datalogic Automation S.r.l. declines any and all responsibility for work carried out on live parts by untrained or unauthorized personnel.

NOTE:

It is forbidden to change the intended use for which the system was designed and developed.
Datalogic Automation S.r.l. declines any and all responsibility for improper use of its equipment.

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1 TECHNICAL SPECIFICATIONS AND ACCESSORIES

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE APPENDIXES.

1.1 TECHNICAL CHARACTERISTICS

RESONATOR MECHANICAL CHARACTERISTICS

Weight	17 Kg
Height	185 mm
Width	180 mm
Depth	634 mm
IP Degree	IP21

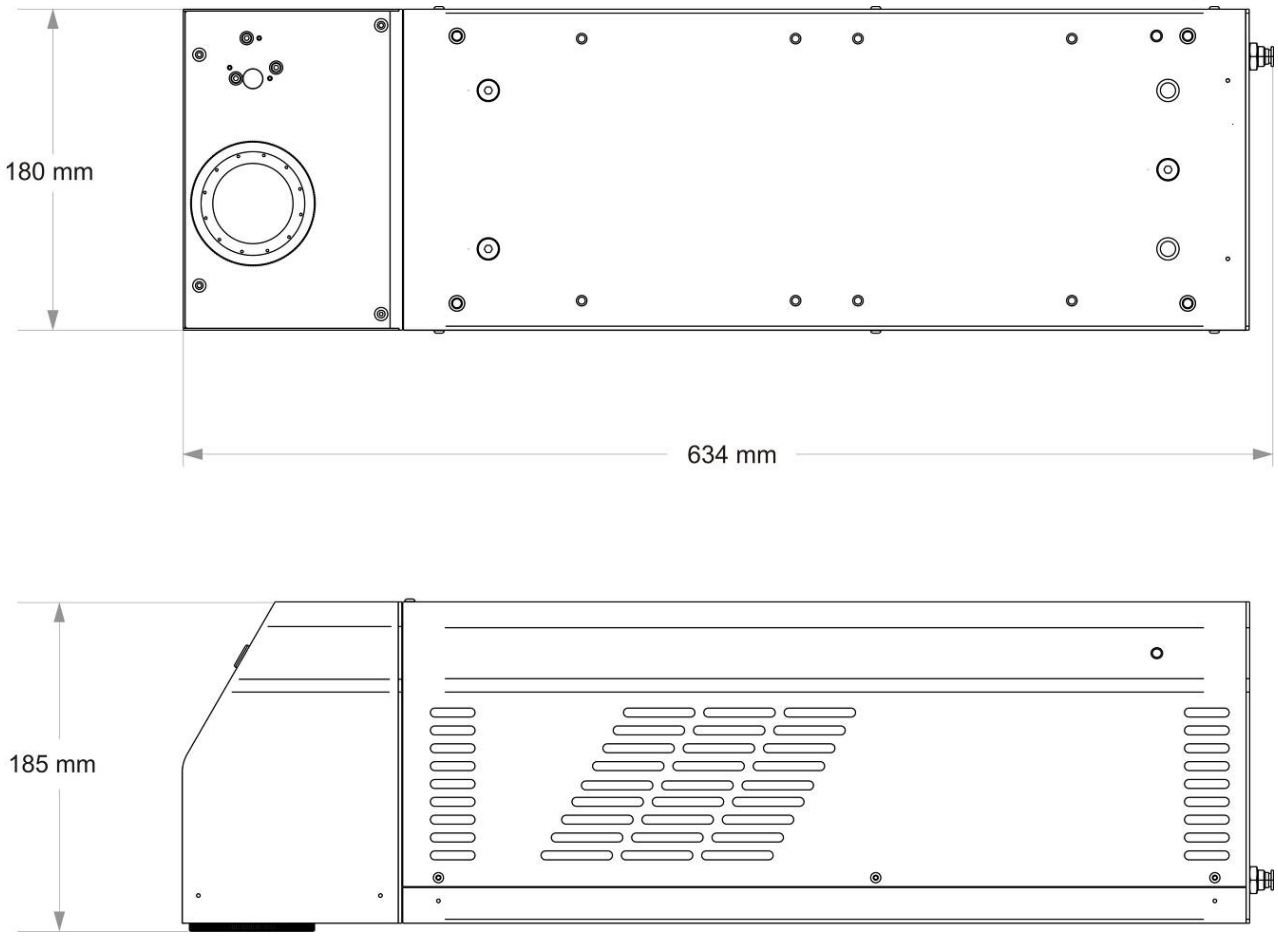


Figure 2: EOX 10W Resonator overall dimensions.

SPECIFICATIONS

Laser Source	CLASS 4, CO_2 sealed laser tube
Configuration	All-In-One
Scanning Head	Straight, Left side, Right side
Average Power[1]	10W
Stability	± 10% (cold start)
Wavelength	10.57-10.63 µm; Peak @10.6 µm
Range Frequency	10 – 25000 Hz; CW
Rise Time	< 150 µs
M2	≤ 1.2
Beam Ø[1]	~ 3.5 mm @ $1/e^2$
Standard Bexp	2x
Ellipticity	< 1.2
Divergence[1]	< 4 mrad
Aiming Beam	2x Class 2M red Diode Laser; λ=635nm ± 5nm; 3mW (aiming and focusing)
Marking Area	70x70 mm = [f = 100mm] 140x140 mm = [f = 100mm]
Marking Speed[2]	2000 mm/sec, 500 chr/sec
Spot Size[3]	270 µm [f = 100mm] 370 µm [f = 200mm]
Cooling	Integrated Fan-Cooled
Power Supply	100/240 VAC – 50/60Hz
Absorption	Typical 400W, Maximum 600W
Marking on the Fly (MOF)	YES [constant speed or encoder]
MOF line speed[4]	Up to 75 m/min – 4 pieces/sec.
Temperature range	Operating: Min. +15 °C (59°F) / Max +35 °C (95°F) Storage: Min. -10°C (-14°F) / Max. +60°C (140°F)
Humidity	0 – 95%, non-condensing
Standard version supplied	Mechanical shutter, I/O control signals Interfaces, 4-axes control Interface, photocell and encoder ports, f-theta lens 100 nm, external connectors and marking software
Inputs	Remote and locals interlock, remote key, remote shutter control, encoder, photocell, start marking, stop marking, pause marking, etc...
Outputs	Marking ready, marking busy, marking complete, good/bad marking, shutter open, alarm/error, etc…
Interface	2x USB 2.0, Ethernet LAN (TCP/IP), VGA, PS/2 keyboard, 4-axes signals, Encoder and photocell, I/O signals and RS232 port
Options	200mm F-Theta lens Photocell

[1] Measured @ resonator exit
[2] May vary: measured with f= 200mm
[3] With Bexp 2x on 10W
[4] Single line string, Roman-s font

1.2 SEALS

Several seals have been applied to the Eox 10W source:

Figure 3: Example of a seal.

The engraving system has seals in some areas. The seals must not be broken or removed for any reason. The sealed parts may be opened only and exclusively by Datalogic Automation S.r.l. Breakage of these seals by a customer shall result in immediate cancellation of the warranty on the entire engraving system.

NOTE:

If a customer **breaks or removes the seals placed** by the manufacturer on the laser system **the warranty** on the entire laser system will immediately become **null and void**.

WARNING!

The manufacturer shall not be held liable for any **non conforming use** of equipment of its manufacture.

It is **forbidden** to operate the equipment before the machine it is intended for has been **declared in conformance** with statutory Directives.

NOTE:

Access to the internal parts of the electrical equipment is only permitted for **authorized personnel**, who have been trained and instructed on the electrical risks!

Datalogic Automation S.r.l. shall not be held liable for work on electrically charged parts by inadequately trained personnel!

NOTE:

Access to the internal parts of the resonator is only permitted for **authorized personnel**, who have been trained and instructed on the optical risks!

Datalogic Automation S.r.l. shall not be held liable for work on parts by inadequately trained personnel!

1.3 CONTENTS OF THE PACKAGING

MAIN HARDWARE

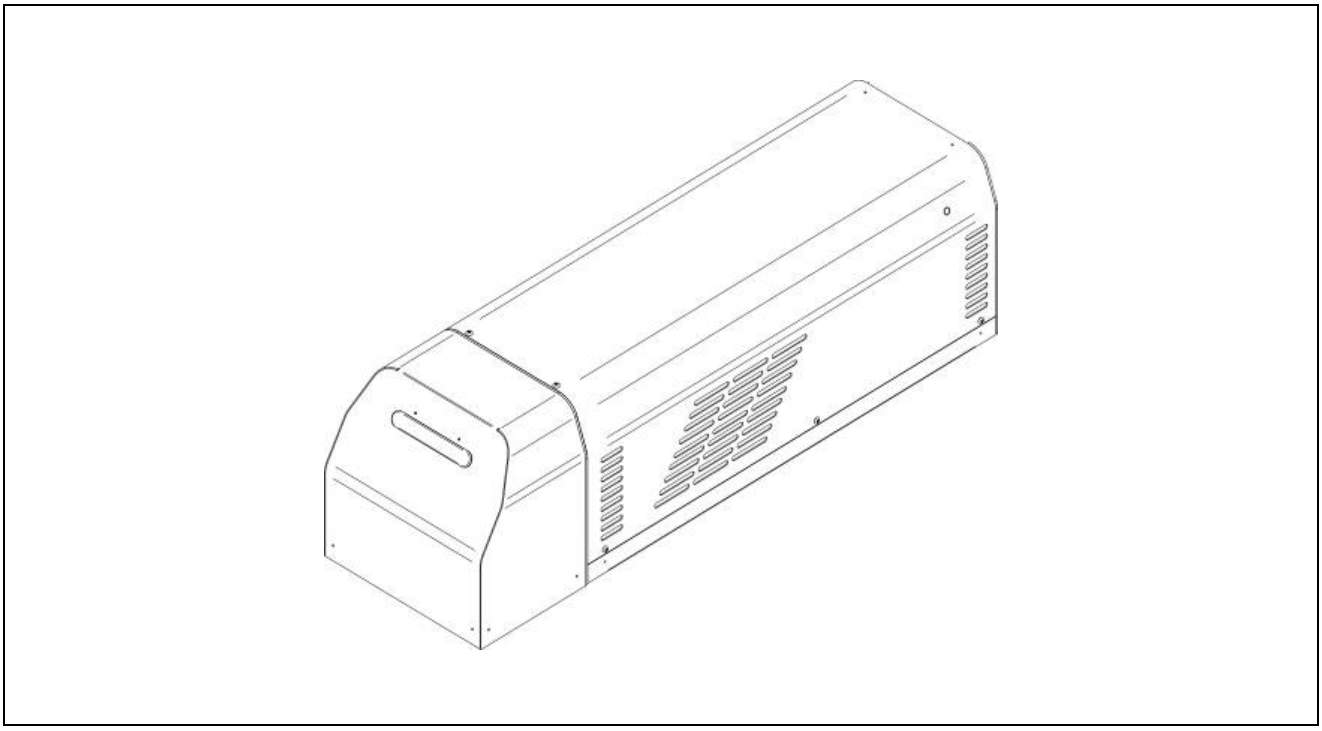


Figure 4: Eox 10W.

CABLE AND ACCESSORIES

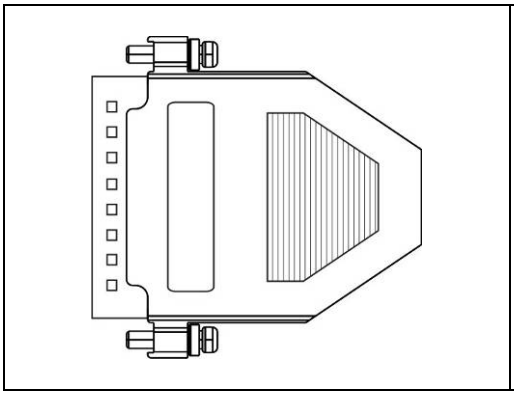


Figure 5: Command Box connector

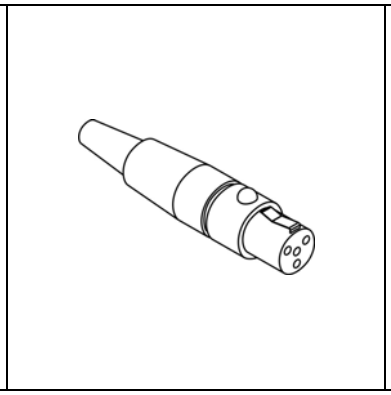


Figure 6: Interlock

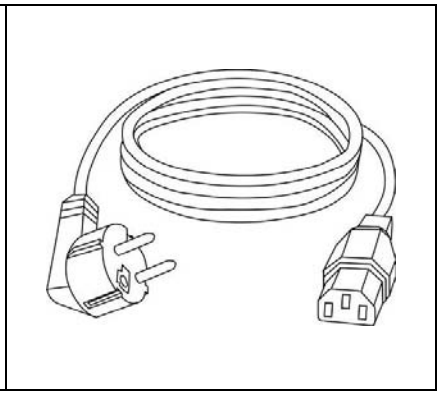


Figure 7: Power supply cable.

1.3.1 FOCAL OBJECTIVES (F-Theta)

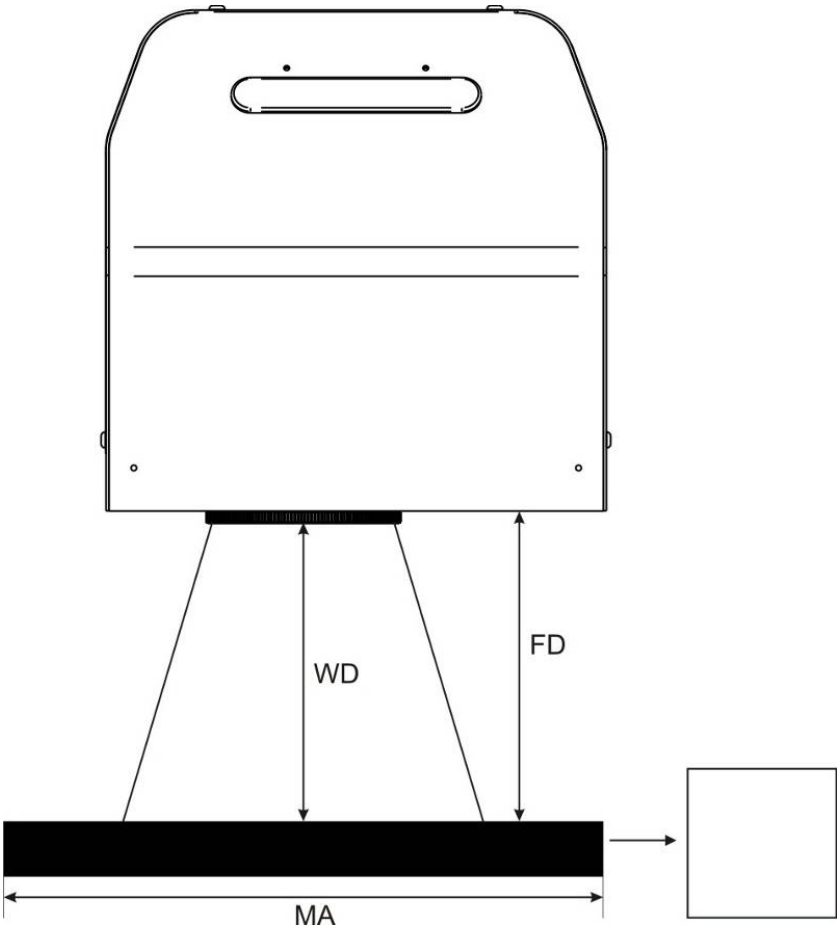
F-Theta Scanning Lenses are commonly used in laser marking, engraving, and cutting systems.
F-theta lenses are designed to provide a flat field at the image plane of the scanning system.Different F-Theta lens models are available upon request to allow different marking areas and to find the best compromise between marking field (or marking areas) and resolution of the marked string or logo, depending on specific needs. These F-Theta lenses are compatible with the standard scanner head supplied by Datalogic Automation; other solutions concerning both the scanner head and the lenses can be evaluated on a case-by-case basis.

F-Theta 1070nm	**100**	**200**
Lens diameter (mm)	**48**	**48**
Working Distance (mm)	100*	200*
Fixing Distance (mm)	100**	200**
Marking Area (mm x mm)	70 x 70	140 x 140

* Tolerance: ± 2mm

** Tolerance: ± 4mm

Note: Working Distance is defined as the distance between the center of the working area (defined in the focal plane) and the last mechanical edge of the F Theta. Reference to the following figure



WD: Working Distance
FD: Fixing Distance
MA: Marking Area

CHAPTER 1

2 INSTALLATION AND SET UP

NOTE:
Eox10 is a **Class 4** laser source.
For proper use under conditions of safety they must be brought to **Class 1**.

Consequently, the Eox 10W laser device must be installed in a suitable environment specifically dedicated to laser jobs.

The person in charge of the area assigned to laser marking (the Laser Safety Officer), has to isolate this area from the other work areas and signal through suitable hazard warnings that the area assigned to laser marking can be accessed by authorized personnel only.

See Appendix for more information.

2.1 UNITS DESCRIPTION

The device is described here below in order to provide the right information for proper device installation.

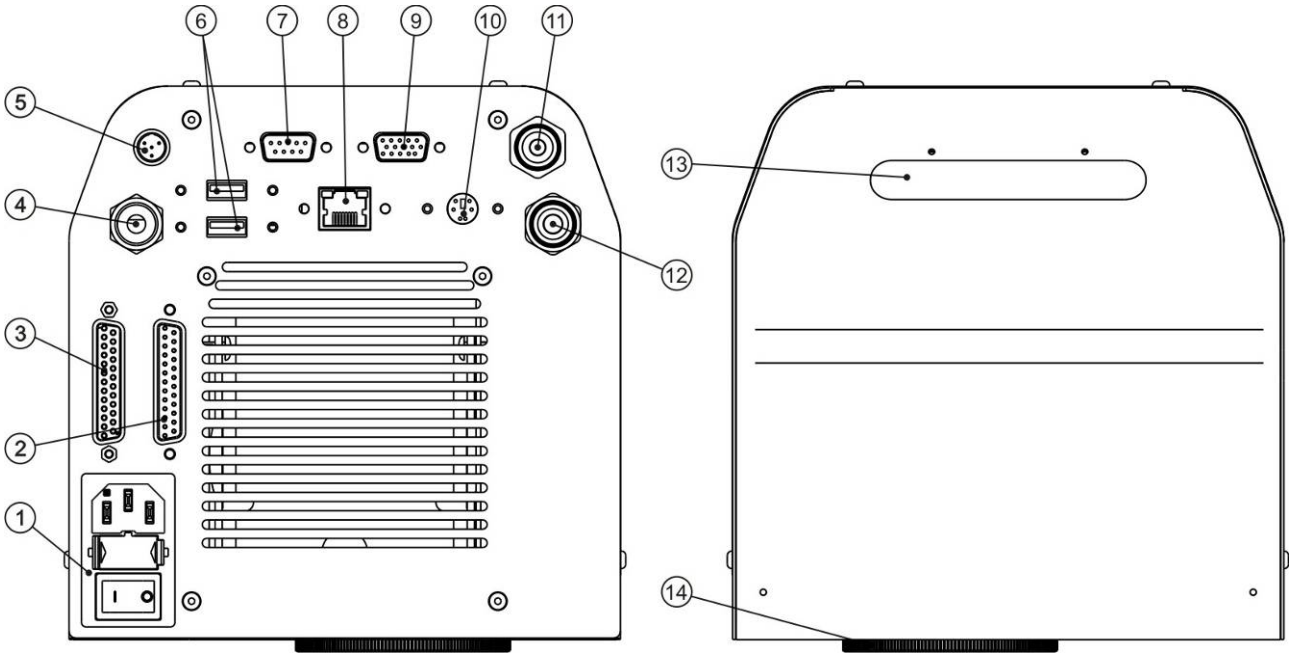


Figure 8: EOX 10W overview.

1) Main power supply	8) LAN
2) Command Box Plug Connector	9) VGA
3) Axes Plug Connector	10) PS/2 keyboard
4) Inlet air	11) Photocell connector
5) Interlock	12) Encoder connector
6) USB 2.0	13) Status Led bar
7) RS232	14) Focal with air compressed issue holes

2.2 INSTALLATION PRE-REQUISITES

Once it is installed in a suitable environment, the Eox 10W marking system is already set for use since it is equipped with an intelligent embedded controller.

If the system is not used in remote mode, a monitor and input peripheral devices (material not included) are nevertheless needed. Once parameters setup on Eox 10W marking system it is possible to work without any input peripheral device connected.

In order to have a normal functionality of the laser system **it is necessary** to prepare an external interface that enables all the requested input.

NOTE:
See chapter 4 for more information.

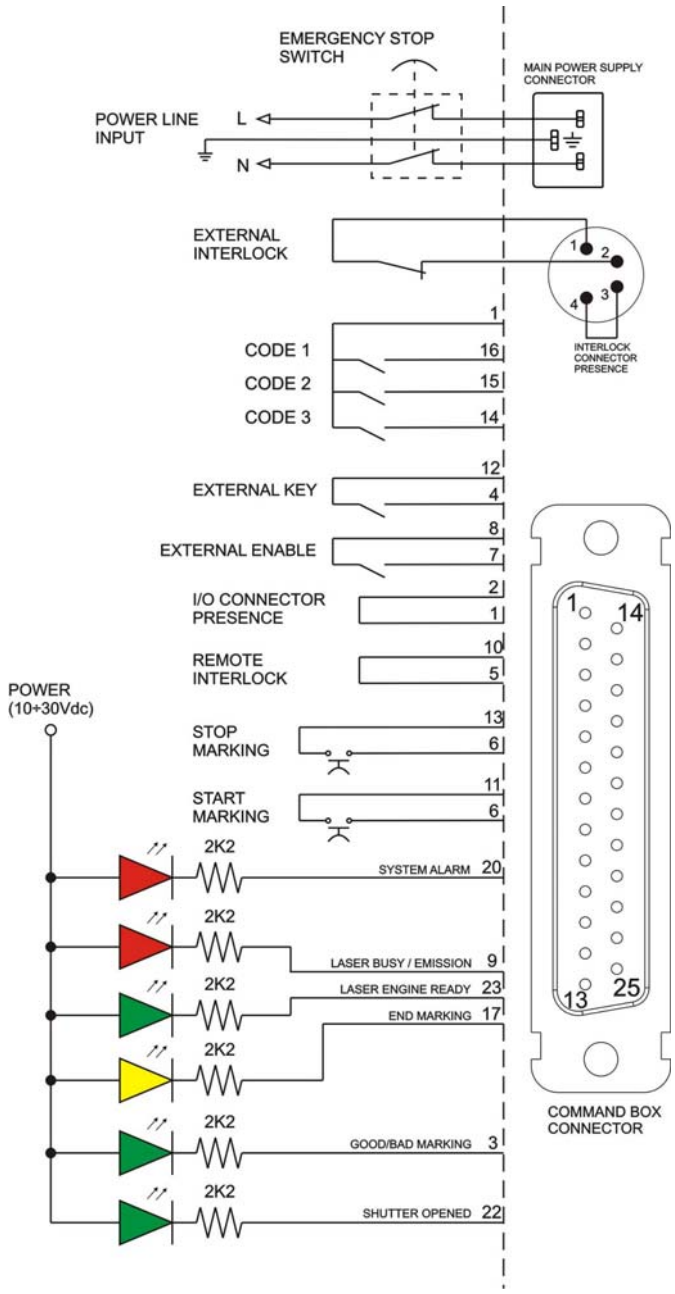


Figure 9: External connections example.

2.3 EOX TRANSPORT

The Eox 10W laser needs to be moved in order to proceed to its positioning and wiring. The Eox 10W device can be easily lifted up and moved by a single person thanks to its compact size and reduced weight.

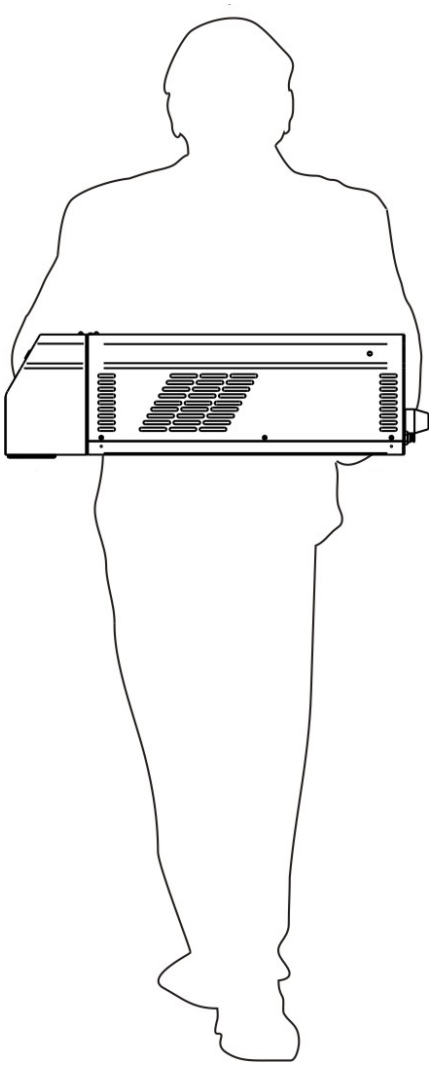


Figure 10: EOX transport.

NOTE:
The Eox 10W laser system is a delicate opto-electronic device, avoid damaging shock and vibrations.

2.4 FIXING AND POSITIONING

The Eox 10W marker must be safely positioned and must be followed below instructions.

The device must be secured to a suitable base (not supplied by Datalogic Automation S.r.l.) using the four M6 threaded holes:

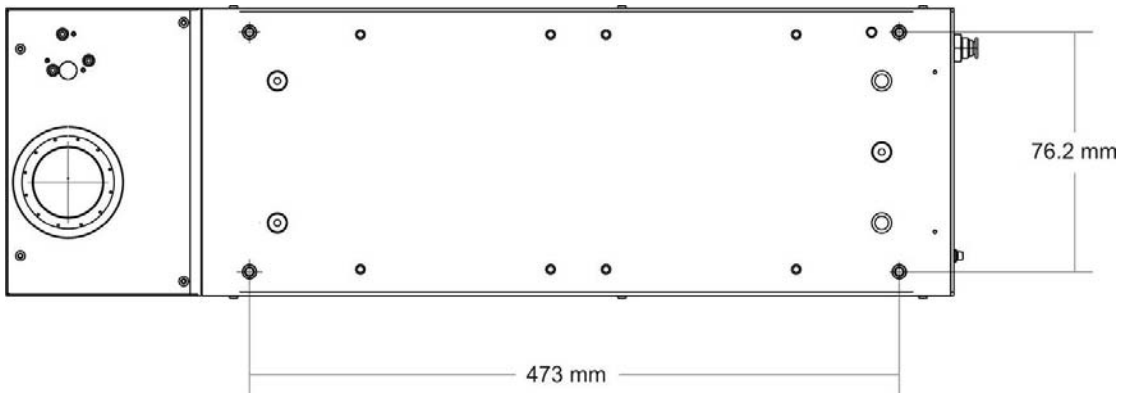


Figure 11: Fixing points on resonator (standard mount).

The Eox 10W device must be safely positioned and secured to a specific surface, parallel to the marking area and totally vibration-free. The resonator can be fixed either vertically or horizontally. In order to prevent marking distortions, fit a vibrometer at the base of the piece to be marked and make sure there are no vibrations during the marking process. It is also possible to request a different position of the scanning head in order to have a side laser output.

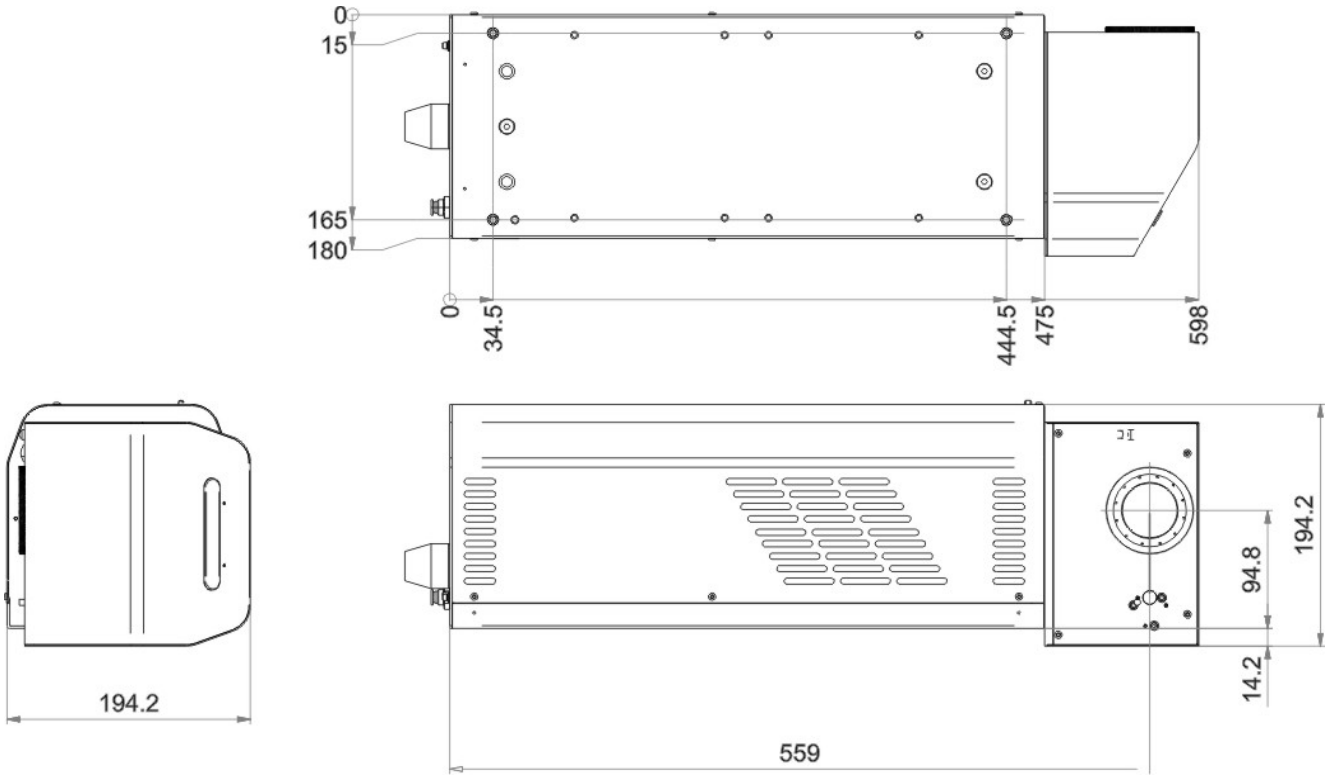


Figure 12: Fixing points on resonator (right angle side).

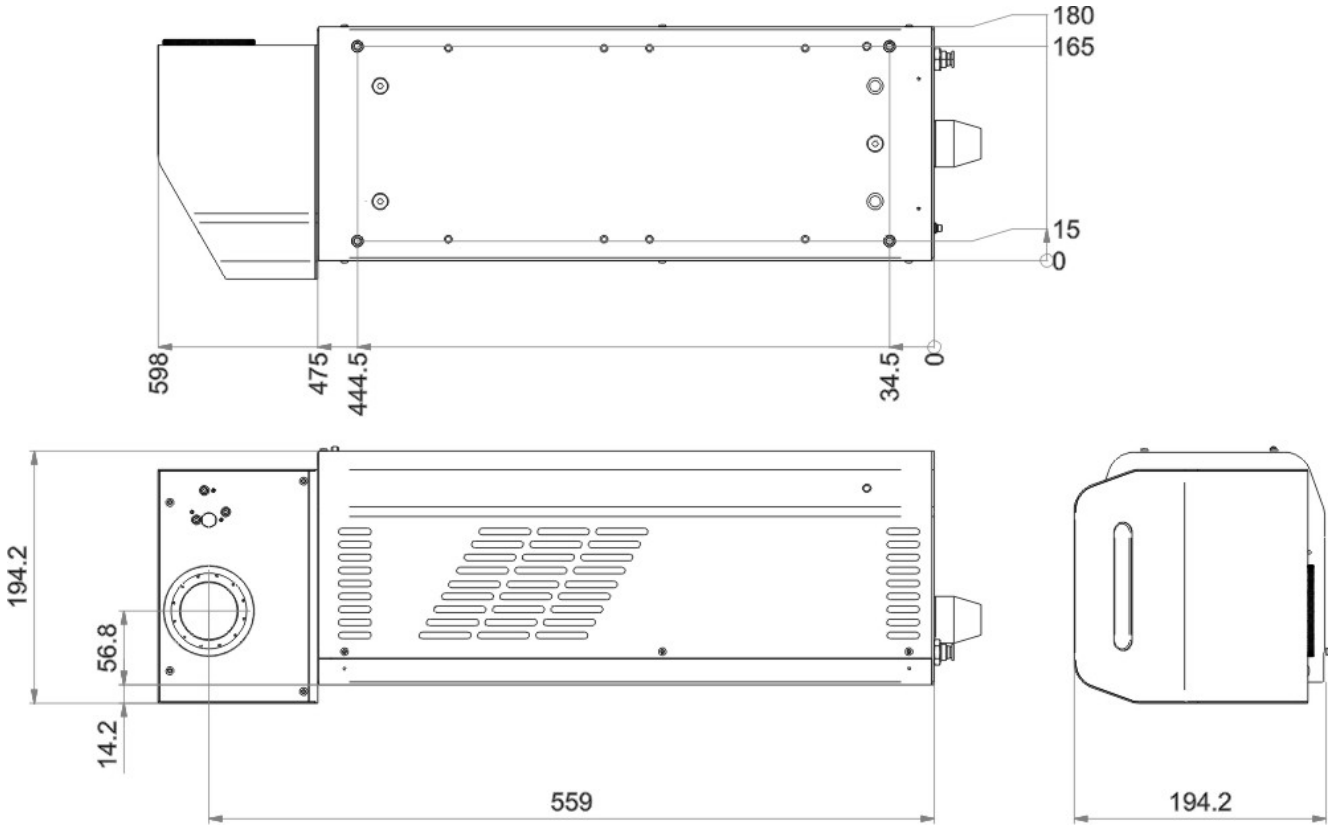


Figure 13: Fixing points on resonator (left angle side).

2.5 INSTALLATION ENVIRONMENT

The Eox 10W device must be installed in a suitable environment in order to allow proper air flow passage and correct housing of the cables:

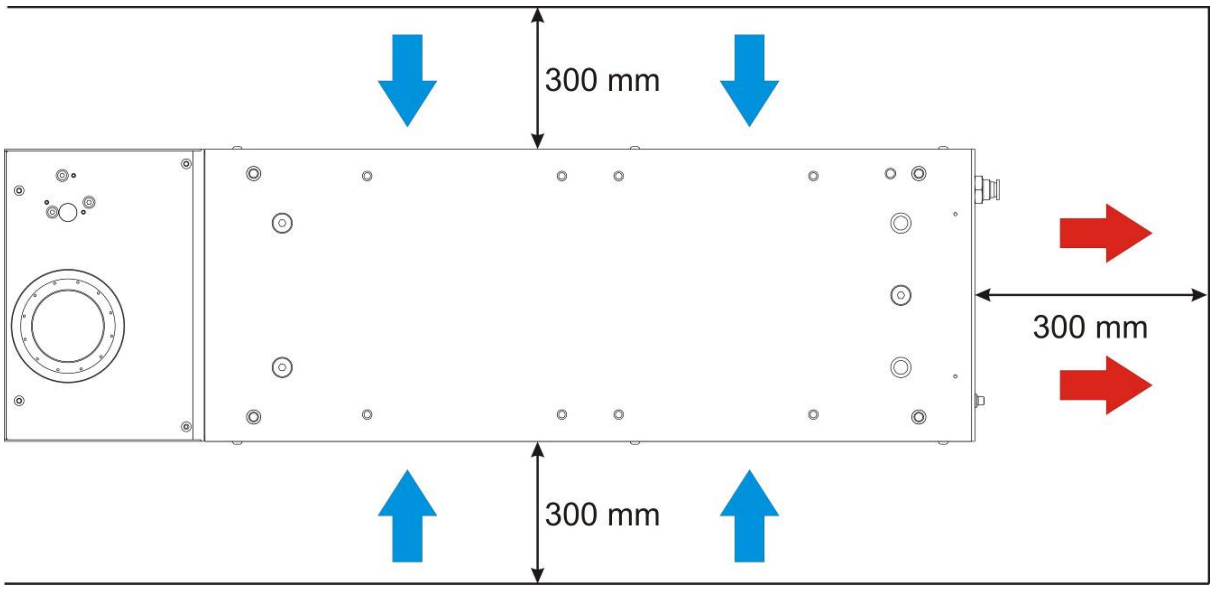


Figure 14: Resonator installation environment.

2.6 WIRING

The machine wiring is described here below. Follow the wiring operations as described.

WARNING:
Wire the devices one to the other **WITH NO** voltage in order to avoid risks to the operator and to the laser source.

2.6.1 CONNECTION COMMAND BOX CONNECTOR

Connect Command Box connector on back panel. If this connection is not present the system can't be used because it goes in error status. Refers to chapter 4 for any further information on external connections.

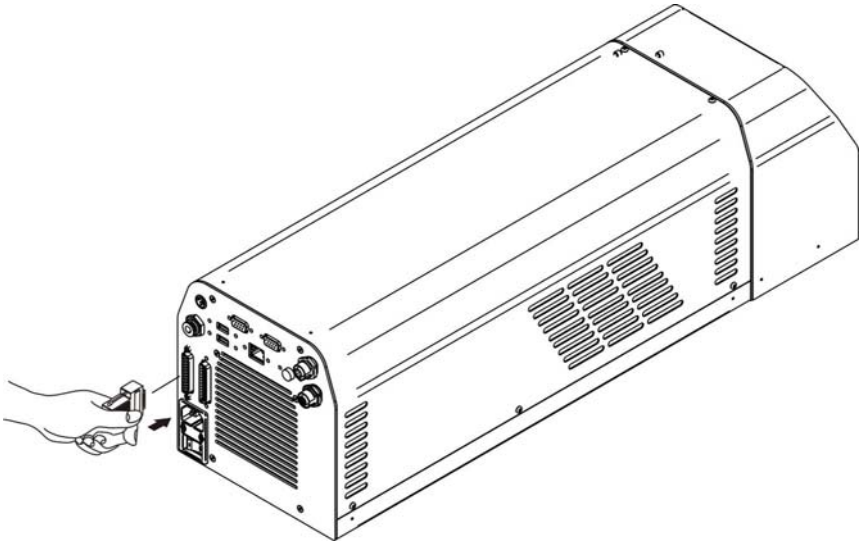


Figure 15: Connection Command Box connector.

2.6.2 INTERLOCK CONNECTION

Wiring interlock connector. The absence of such connector shuts down the device.

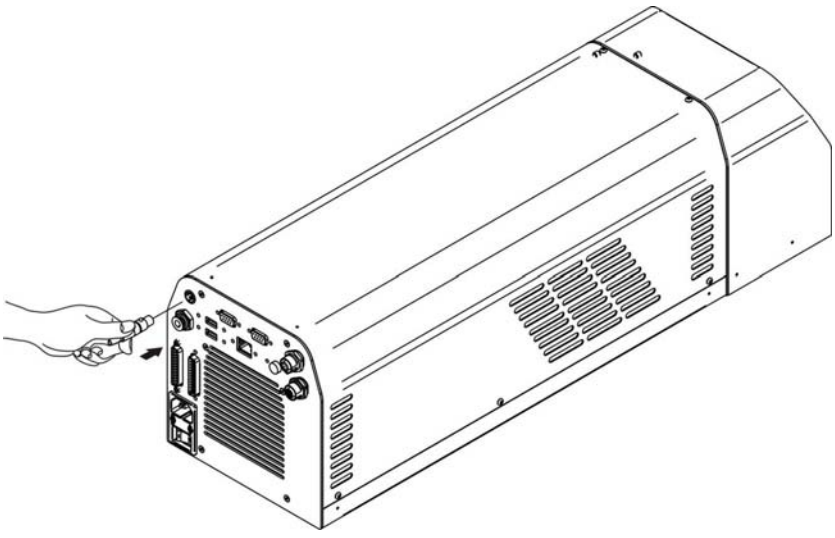


Figure 16: Interlock connection.

2.6.3 POWER SUPPLY CONNECTION

WARNING:
First of all, make sure the power supply is turned off, and consequently that there is no voltage in the cables connecting power supply.

Wiring power supply cable (100÷240VAV 50÷60Hz).

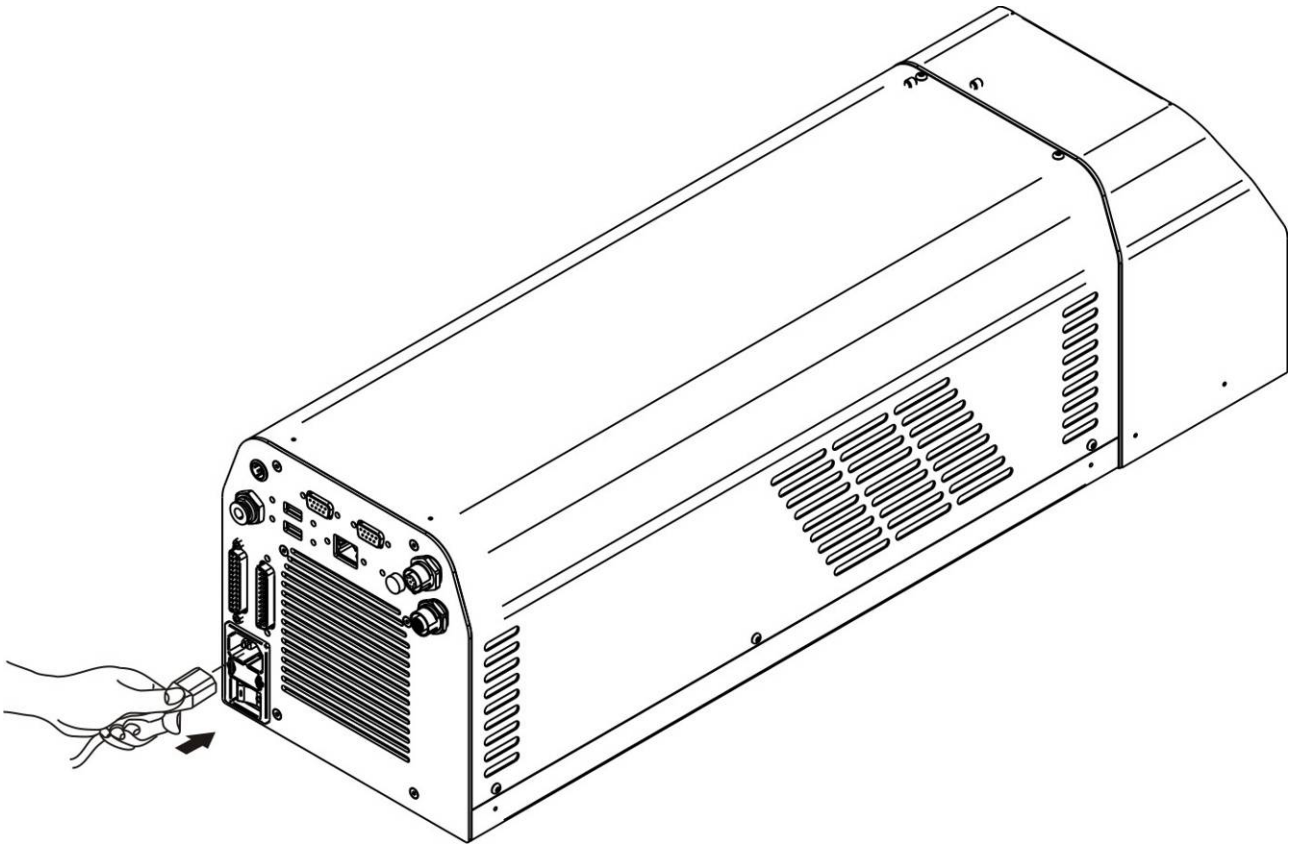


Figure 17: Wiring power supply cable.

2.6.4 LOCAL CONTROL MODE CONNECTION

To use the laser in “Local Control” mode is necessary to use an USB mouse, PS/2 keyboard and VGA monitor. After setting up system parameters and marking project selection is possible to use the system without input peripheral devices connected. If automatic mode is selected on the marking software it is possible to work without help of operators. Connect VGA monitor and input devices as shown below:

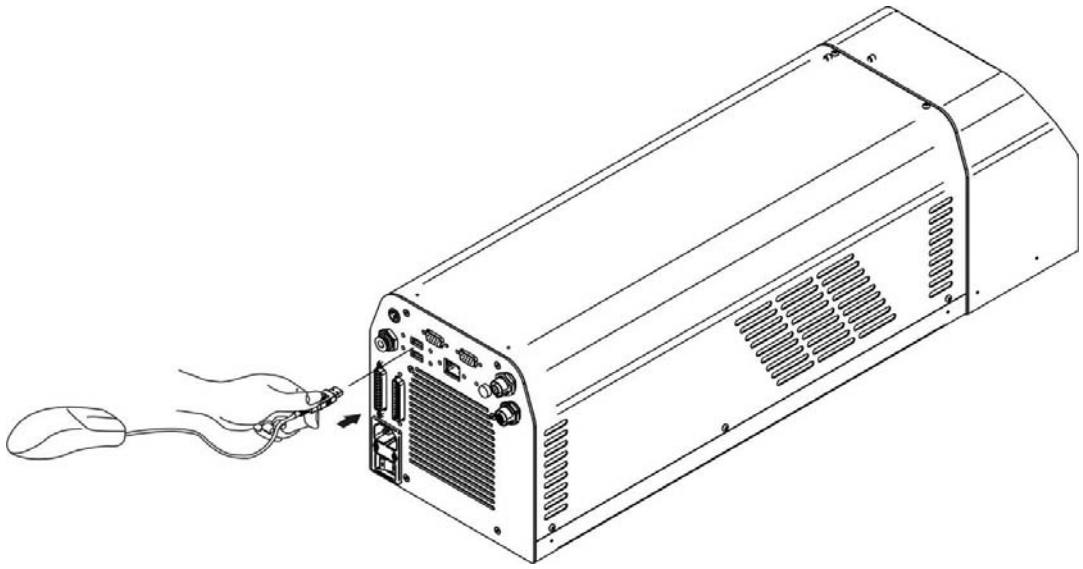


Figure 18: USB mouse connection.

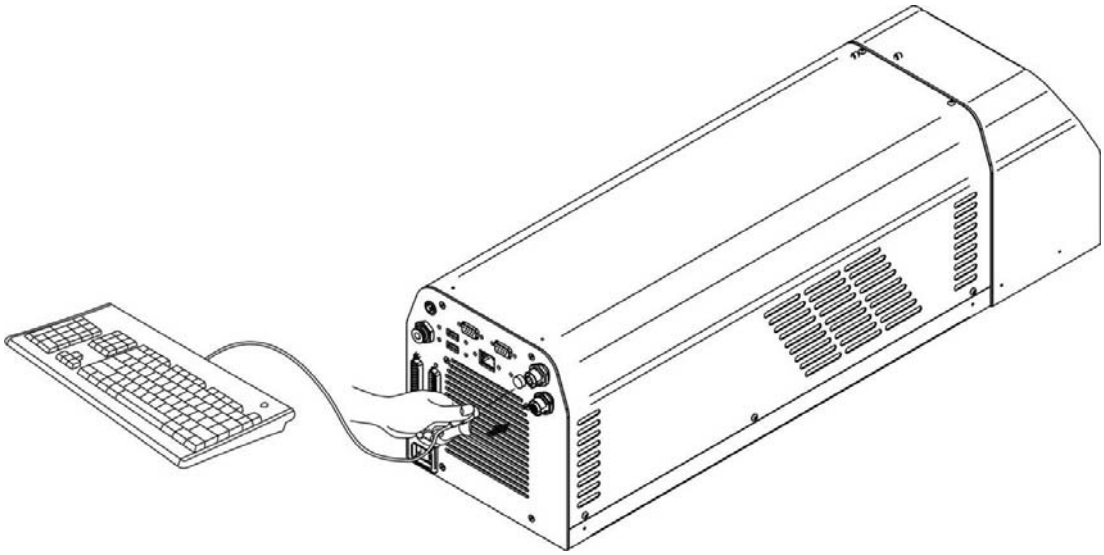


Figure 19: PS/2 keyboard connection.

NOTE:
It is also possible to connect input devices using the **USB** Connection.

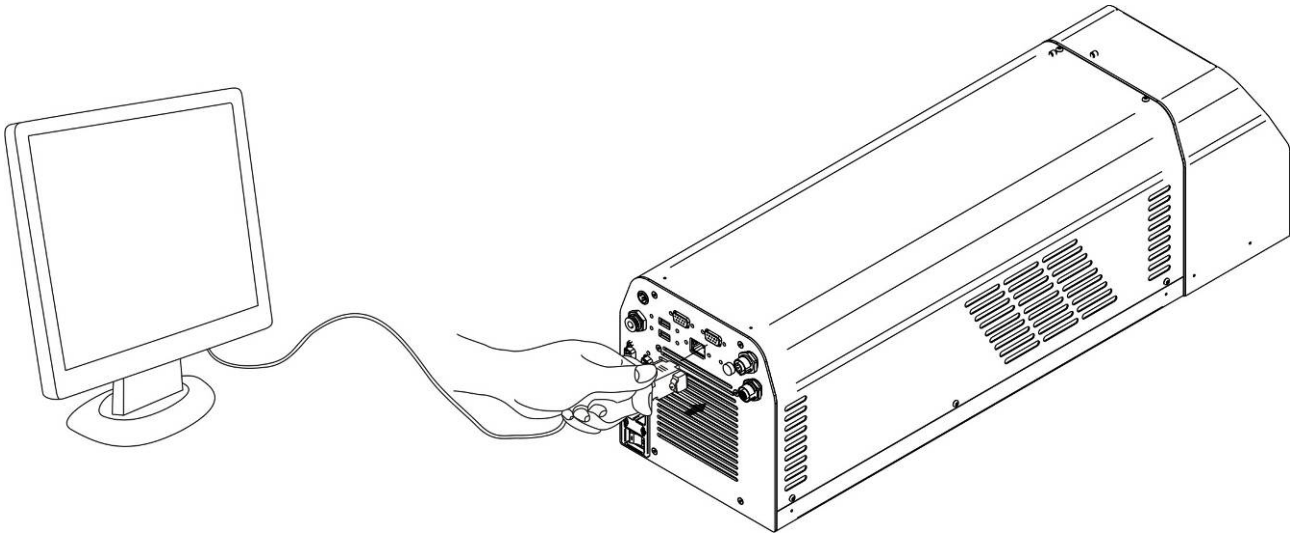


Figure 20: VGA monitor connection.

2.6.5 REMOTE CONTROL MODE CONNECTION

To use “Remote Control” mode it is necessary a LAN cable connection. This configuration permits to control the system by an external PC in order to send from a remote position a marking project and check the laser status.

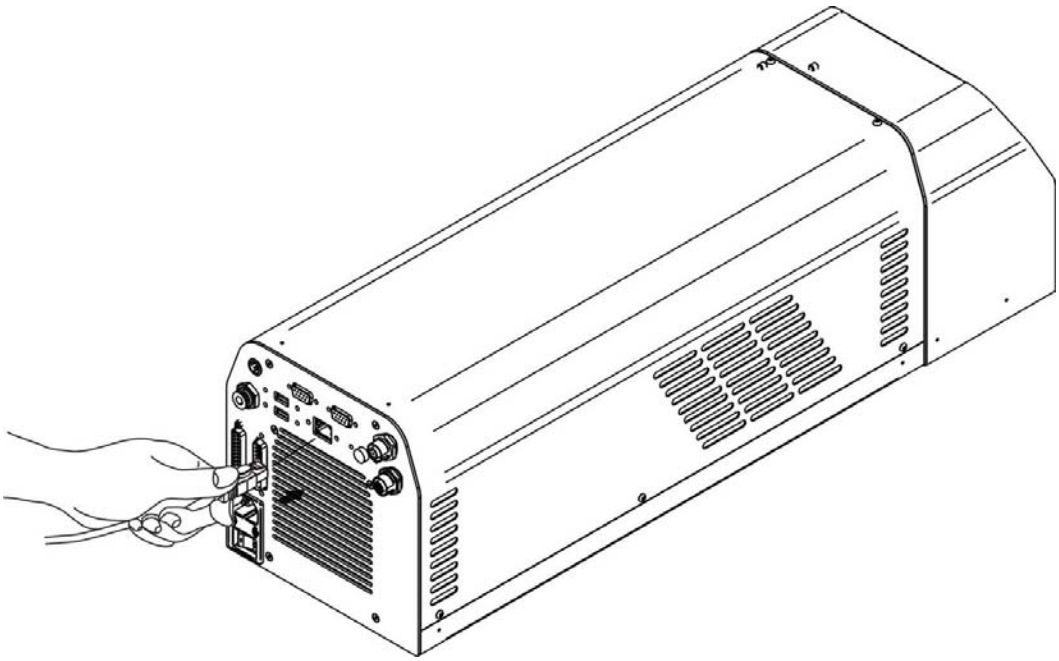


Figure 21: Ethernet connection.

2.6.6 AXES CONNECTION (I/O CONTROL)

In case of moving axes control it is possible to connect to a dedicated port (Refer to chapter 4 for any further information).

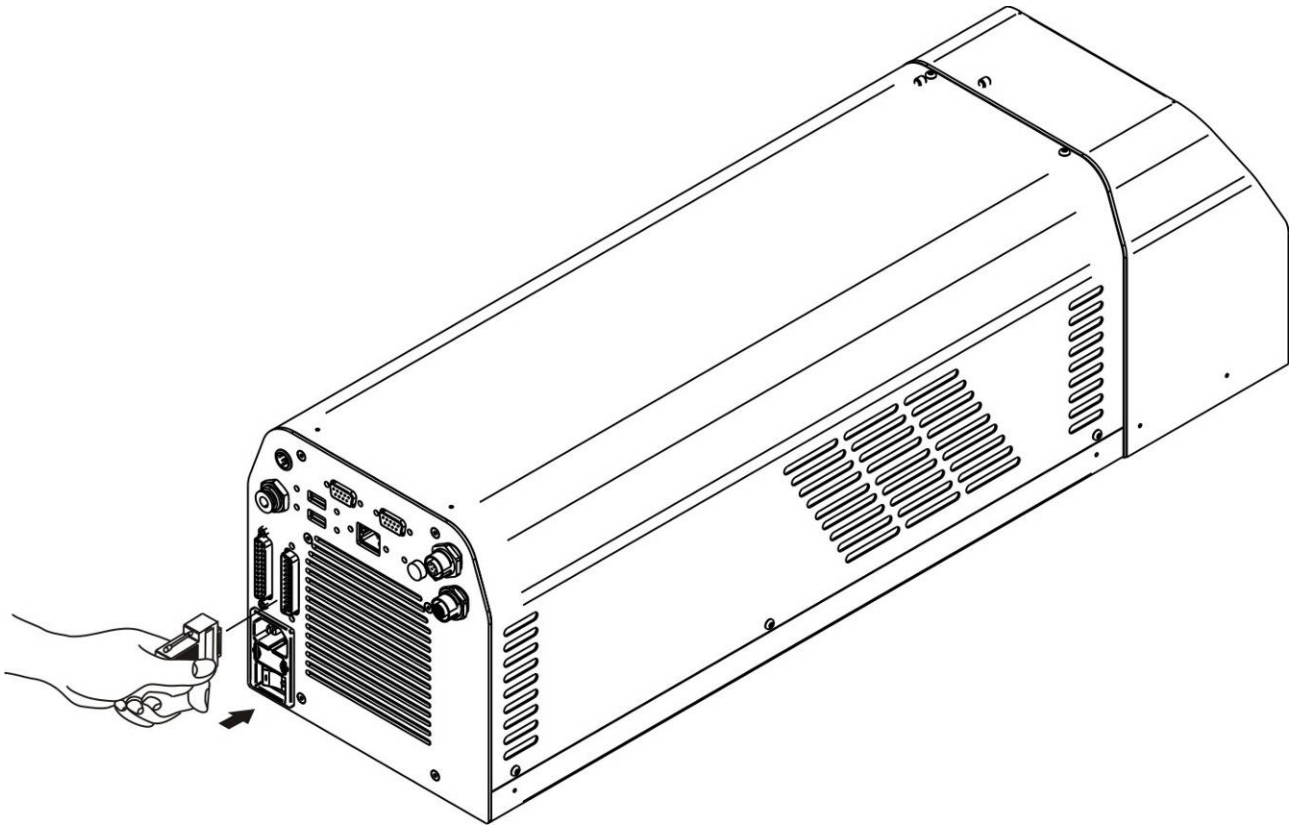


Figura 22: Axes connector connection.

2.6.7 MARKING ON FLY MODE CONNECTION

Dynamic state of marking is used for critical production where it is not possible to stop the marking objects. To use the laser device in “Marking on fly” mode is necessary wiring a photocell sensor and an encoder (not supplied by Datalogic Automation):

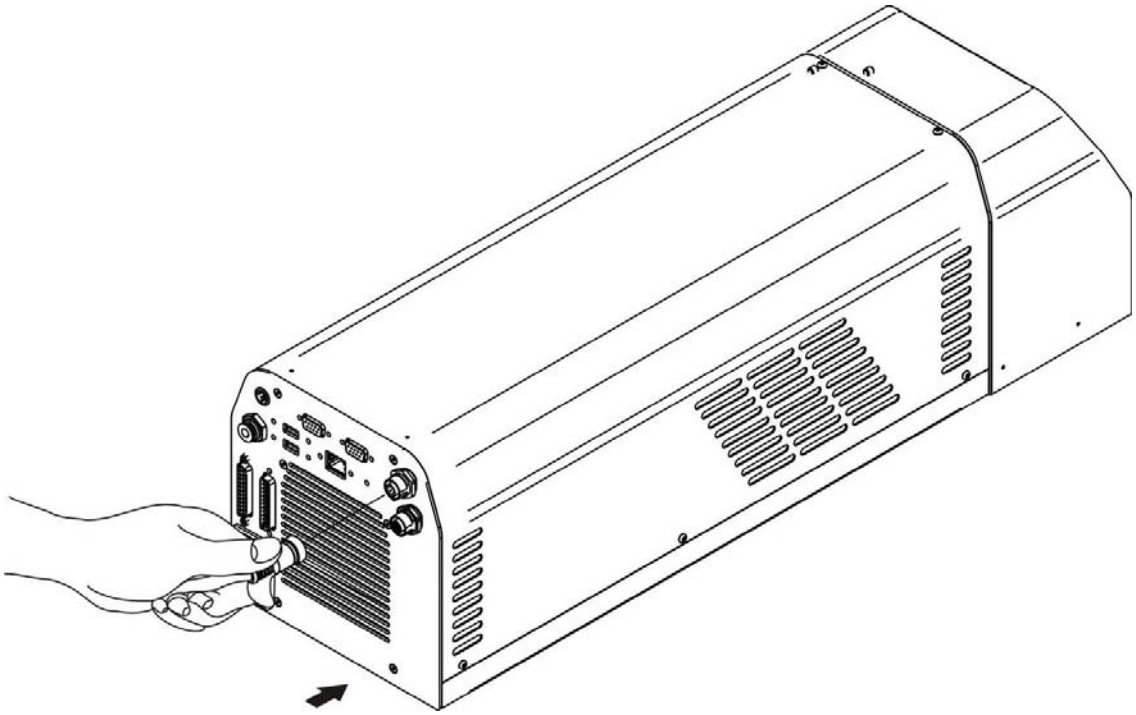


Figure 23: Photocell connection.

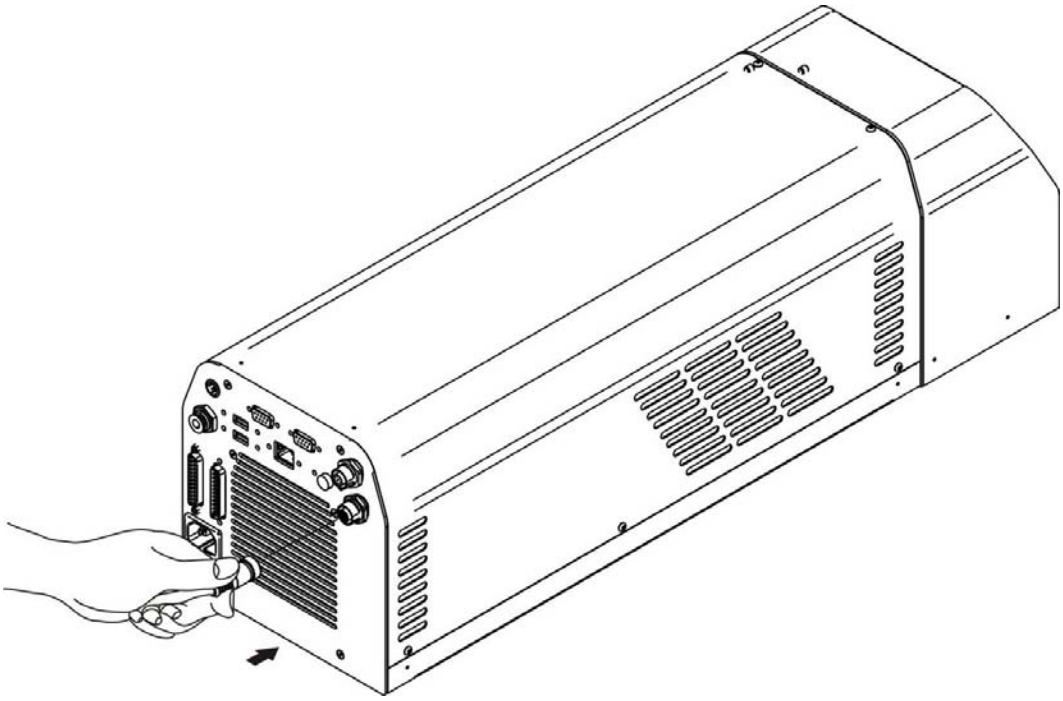
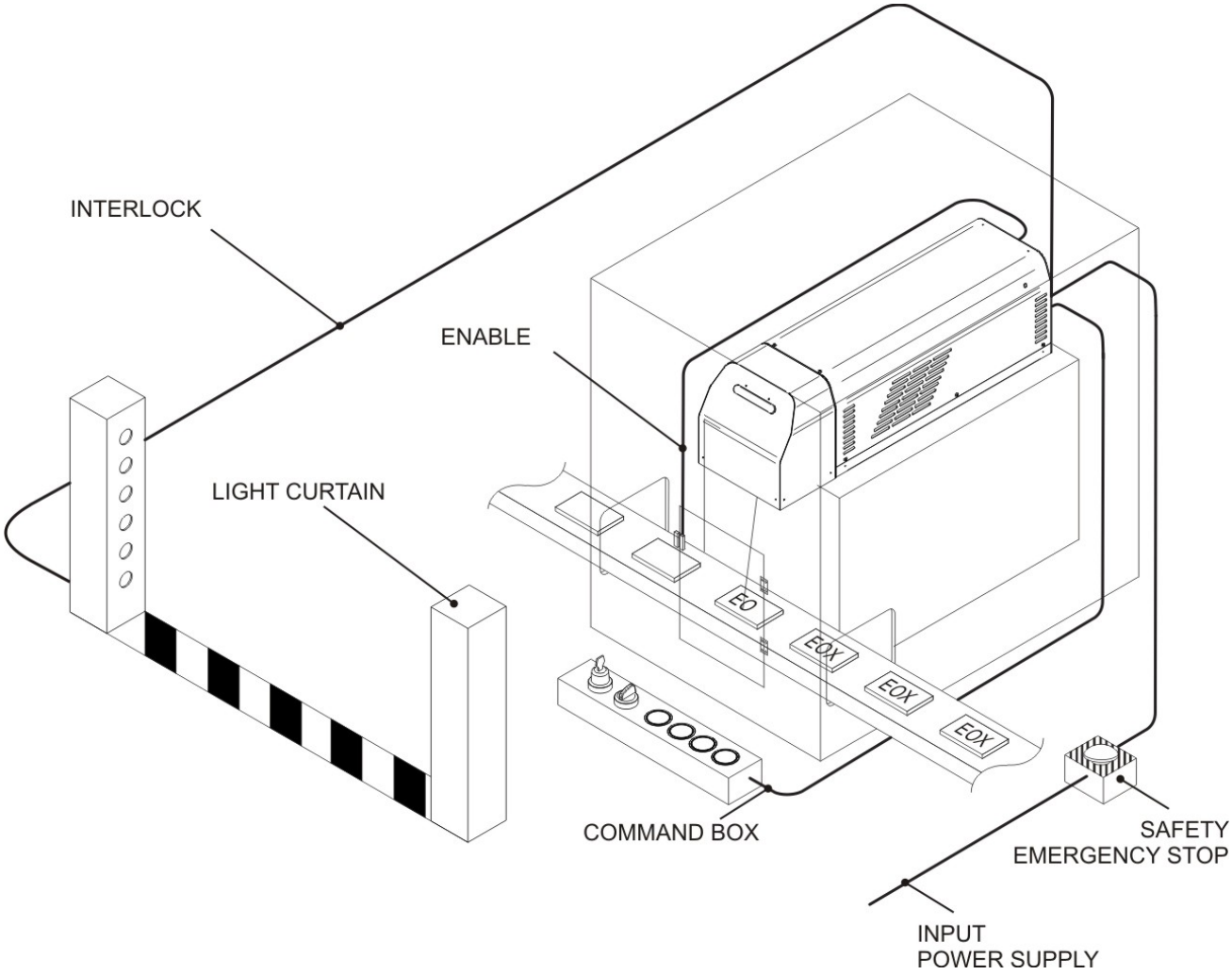


Figure 24: Encoder connection.

CONNECTIONS EXAMPLE

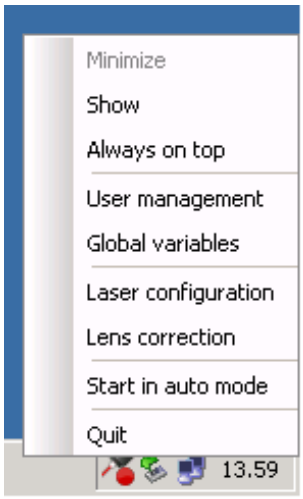


NOTE:
It is important to install an **emergency circuit** able to cut input power supply (VAC) **switching off** Eox entirely. This safety circuit needs to be installed from qualified personnel only.

2.7 SOFTWARE UPGRADE

This document describe how to update SW version on Eox systems:

1. Close the Lighter and Laser Engine (Click on “*QUIT*”)

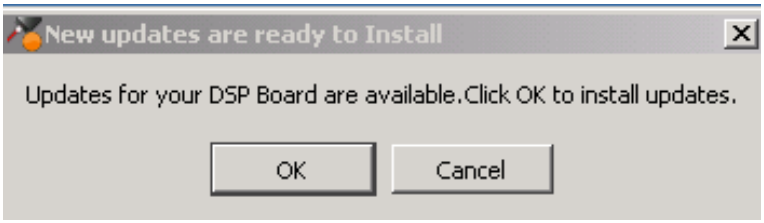


2. Do Lighter “*UNISTALL*”: you can’t run the new installer before having removed the old SW version.

3. Wait the end of uninstall procedure.

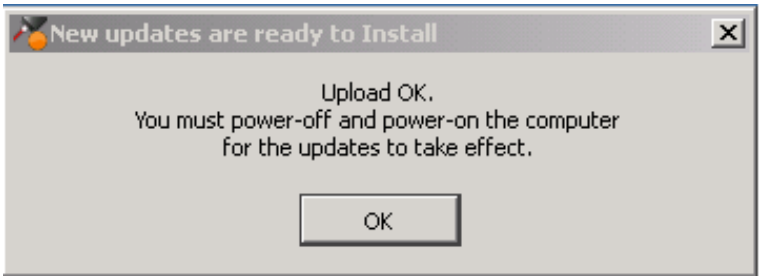
4. Run the new SW version installer.

5. At the and Laser Engine start automatically and a pop up appears:



Click OK and wait

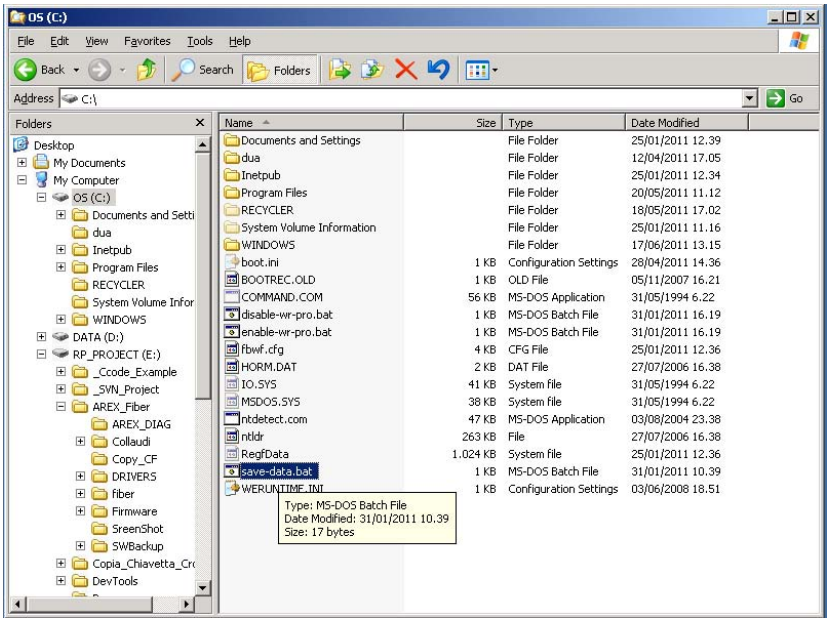
6. At the and Laser Engine start automatically and another pop up appears:



Click OK but **don't restart the system !!!!!**

WARNING:
DO NOT restart the system or turn off Eox!

7. Run **`c:\save-data.bat`**



8. Then shut down Windows with shutdown button

9. Wait the end of Windows shut down before turn off Eox.

10. Turn OFF Eox

CHAPTER 2

3 USE AND OPERATION

3.1 POWER ON PROCEDURE

First to proceed with turn on the Eox 10W laser system, **insure to a right device connection like described previously**.

NOTE:
First to use laser system must be read marking software user manual.

Proceed as follow:

1) Provide power supply to the device by pressing the switch on the power input jack:

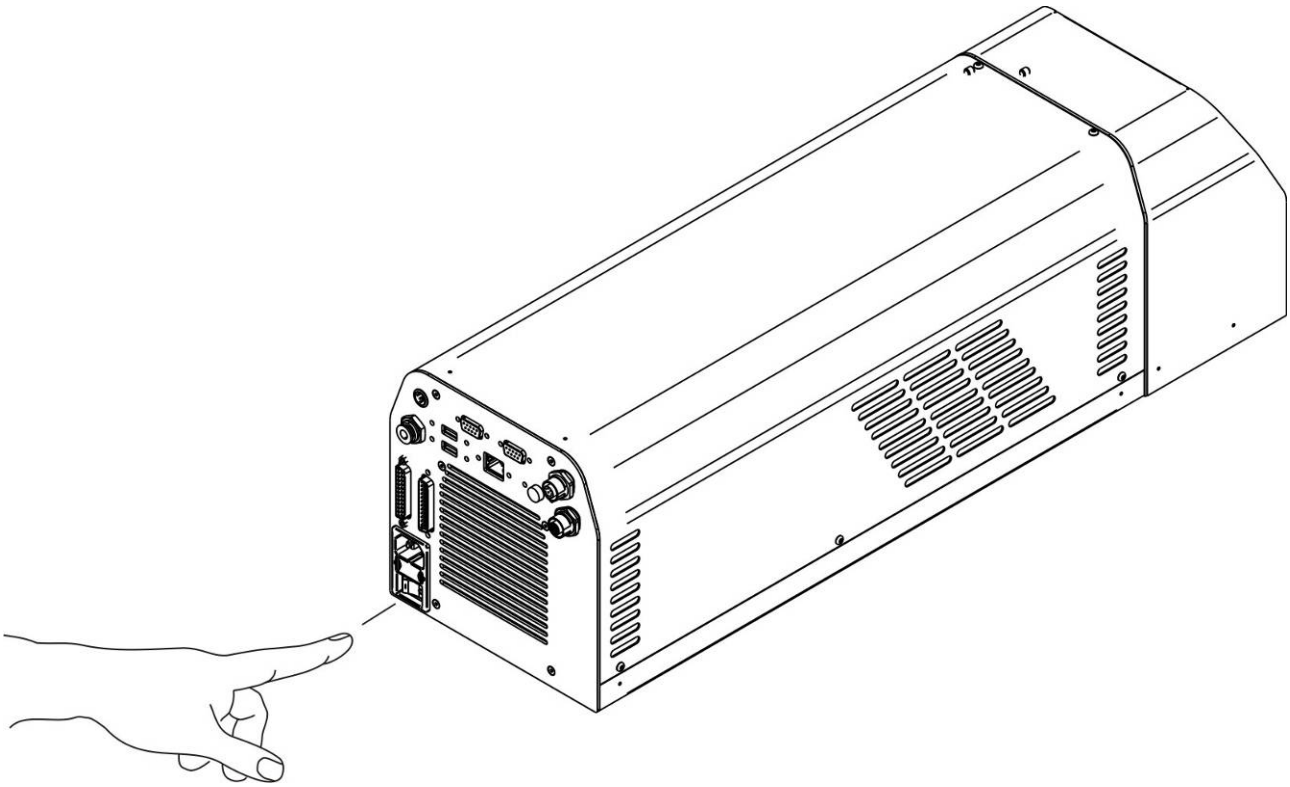


Figure 25: Power on.

If the system is turned on cooling fans are running. Through Command Box connector on back panel is possible to check that the system is switched on by auxiliary 12VDC voltage available on the output pins.

2) After initialization procedure is done (warm up) the system allows to able "*KEY*" signal on Command Box connector available of back panel:

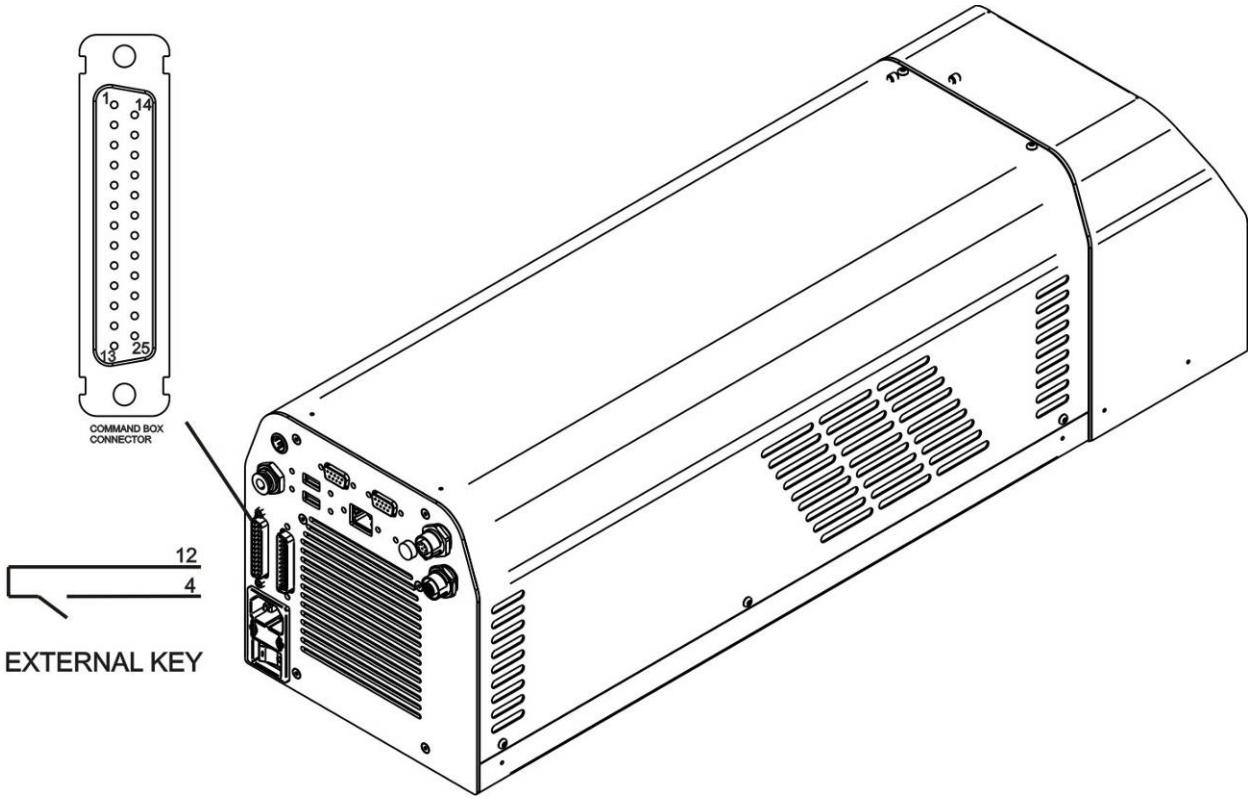


Figure 26: KEY command activation.

With "*KEY*" signal activated led bar on the system comes green and "laser active" signal is enabled on Command Box connector.

NOTE:
Refer to chapter 4 for any further information on the connections.

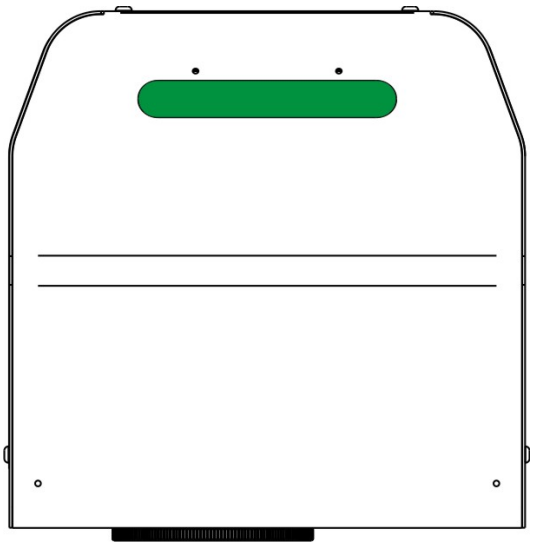


Figure 27: Status led display.

3) Now activate the "*ENABLE*" signal on the Command Box connector:

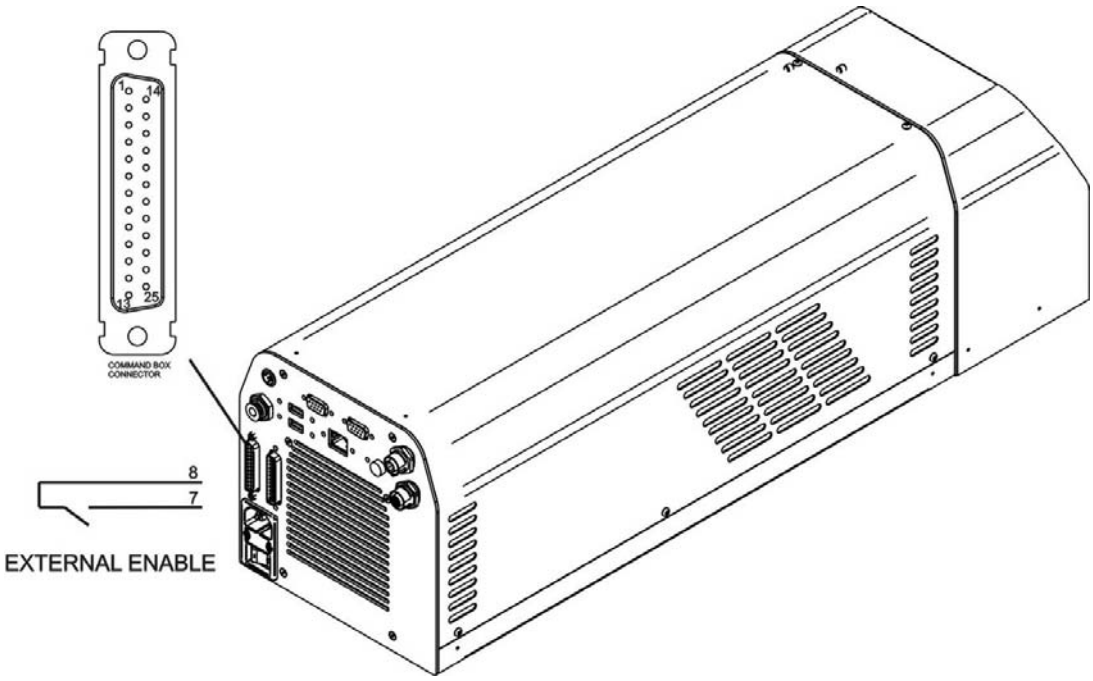


Figure 28: ENABLE command activation.

NOTE:
Refer to chapter 4 for any further information on the connections.

WARNING:
During this status, the shutter is opened and **it is possible to have LASER beam output!**

The system is ready to mark. The led bar status on device will turn orange. "*SHUTTER_OPEN*" signal will activate on Command Box connector in the back panel.

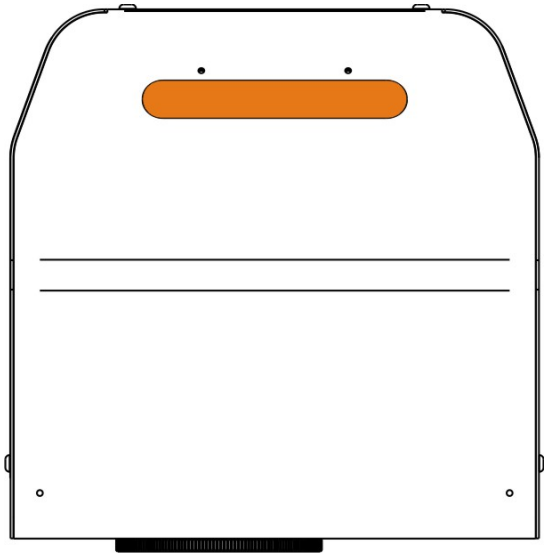


Figure 29: Status led display.

4) To laser emission it is possible to operate manually through the marking software or in automatic mode by external START signal. During the emission led bar will be red. “Busy” output signal will be active on the Command Box connector in back panel.

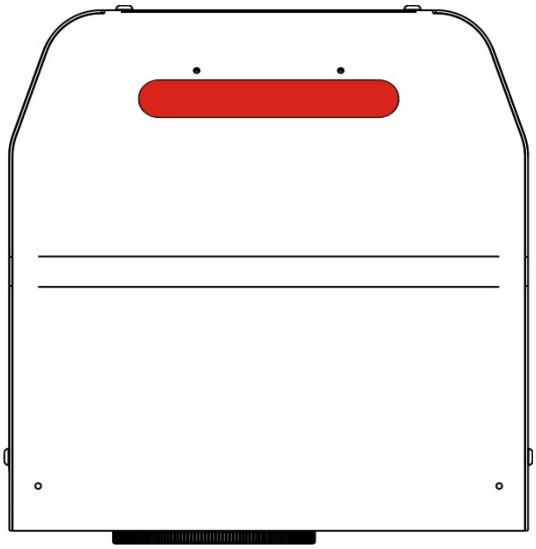


Figure 30: Status led display.

NOTE:
Refer to chapter 4 for any further information on the connections.

4 TECHNICAL SPECIFICATION

4.1 EXTERNAL CONNECTORS SPECIFICATIONS

4.1.1 INTERLOCK – PANEL PLUG

SWITCHCRAFT panel plug, Tini Q-G range, 4-way. The interlock signal makes the laser safe in case of a dangerous situation for the operator. The interlock function causes **the machine to turn off**. To reset the machine, the system must be restarted.

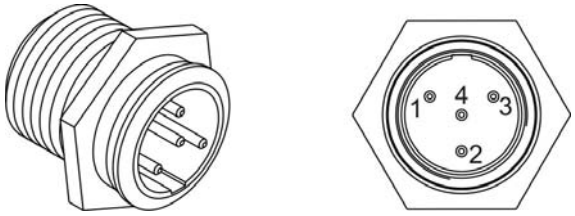


Figure 31: Male panel plug cod. TB4M (front view).

PIN	SYMBOL	TYPE	DESCRIPTION
1	INTERLOCK A+	OUTPUT	External safety signal output A
2	INTERLOCK A-	INPUT	External safety signal return A (Presence = closed contact)
3	INTERLOCK B+	OUTPUT	External safety signal output B
4	INTERLOCK B-	INPUT	External safety signal return B (Presence = closed contact)

Table: Interlock plug Pin-out.

4.1.2 INTERLOCK – MOVABLE SOCKET

SWITCHCRAFT movable socket connector, Tini Q-G range, 4-way.

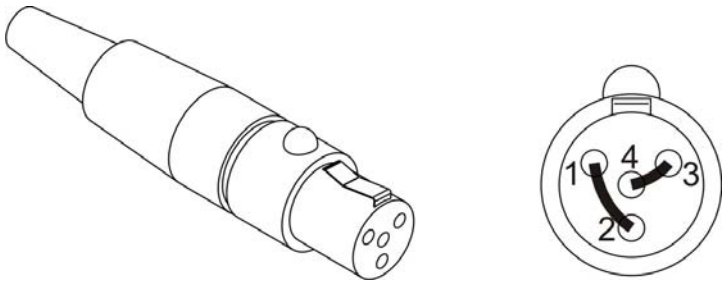


Figure 32: Female movable socket cod. TY4F (solder view).

4.1.3 ENCODER CONNECTOR

Panel socket BINDER, 8-way female, 763 series. This connection is used to interface an encoder if Marking On Fly mode is used.

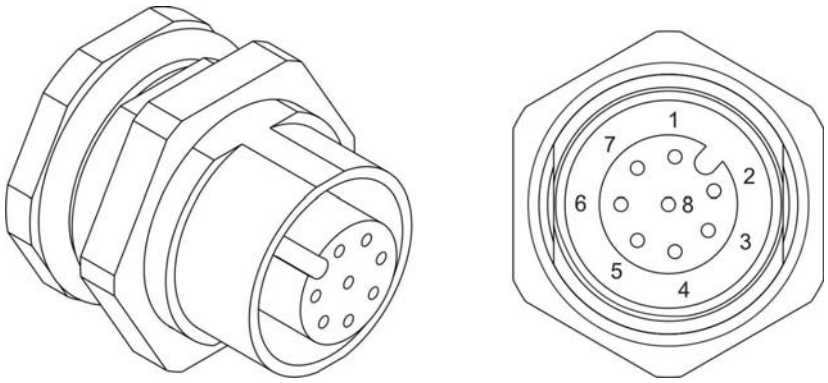


Figure 33: Female panel socket cod. 09-3482-87-08 (front view).

PIN	SYMBOL	TYPE	DESCRIPTION
1	VCC	POWER OUTPUT	12V DC power supply
2	GND	GND	Ground signal
3	ENC_A	DIGITAL INPUT (12VDC)	Encoder HTL A channel signal
4	GND	GND	Return signal for ENC_A
5	ENC_B	DIGITAL INPUT (12VDC)	Encoder HTL B channel signal
6	GND	GND	Return signal for ENC_B
7	SHIELD	HEART	Ground
8	PAUSE	DIGITAL INPUT (12VDC)	Reporting stop encoder

4.1.4 PHOTOCELL CONNECTOR

Panel socket BINDER, 4-way female, 763 series. This layout allows to connect a PNP photocell in dark mode configuration with M12 insertion and a pin to pin interface.

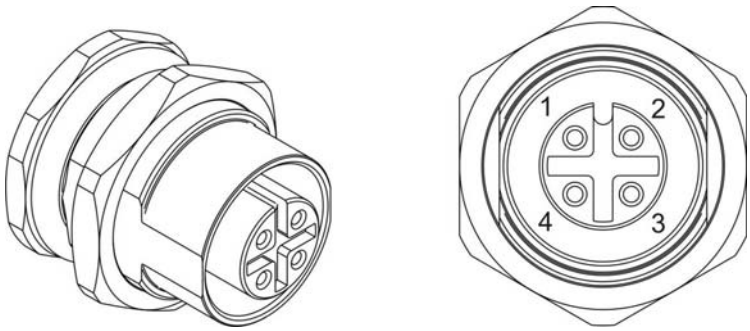


Figure 34: Female panel socket cod. 09-3482-87-04 (front view).

PIN	SYMBOL	TYPE	DESCRIPTION
1	GND	GND	Ground signal
2	VCC	OUTPUT	12V DC (or 5V DC) power supply
3	VCC	OUTPUT	12V DC (or 5V DC) power supply
4	PHOTOCELL	INPUT	PNP photocell signal

4.1.5 COMMAND BOX CONNECTOR – PANEL SOCKET

Panel socket SUB-D, 25-way, female. This connection is used for interfacing external command and control signals.

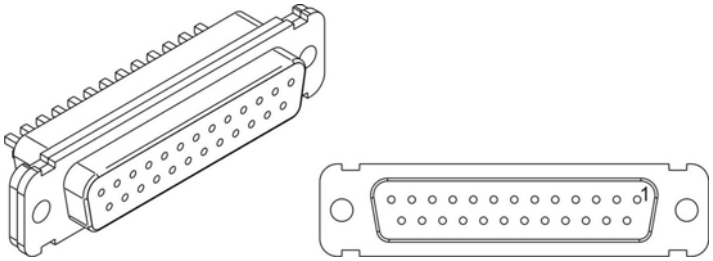


Figure 35: Female panel socket SUB-D 25 (frontal view).

PIN	SIGNAL	TYPE	DESCRIPTION
1	EXT_12V	Output power supply	12Vdc output supply (max 1A)
2	CONN_PRESENCE	Input	Connector Presence (12V = OK ; 0V = FAULT)
3	GOOD/BAD	Open-collector digital output (max 200mA)	Good/Bad Marking Signal (Closed = Bad ; Open = Good)
4	EXT_12V	Output power supply	12Vdc output supply (max 1A)
5	EXT_12V	Output power supply	12Vdc output supply (max 1A)
6	EXT_12V	Output power supply	12Vdc output supply (max 1A)
7	EXT_12V	Output power supply	12Vdc output supply (max 1A)
8	EXT_ENABLE	Digital Input (12Vdc)	Remote Enable Signal (12V = Enable ON ; 0V = Enable OFF)
9	BUSY	Open-collector digital output (max 200mA)	Laser Busy signal (active during marking) (Closed = Busy ; Open = NOT Busy)
10	EXT_INTERLOCK	Digital Input (12Vdc)	Safety Remote Interlock Signal (12V = Presence ; 0V = NOT Presence)
11	START_MARKING	Digital Input (12Vdc)	Start marking external command (12Vdc pulsed signal) Default active high (configurable on internal board) ** see figure 36 for configurations.*
12	EXT_KEY	Digital Input (12Vdc)	Remote Key Signal (12V = Laser Source ON ; 0V = Laser Source OFF)
13	STOP_MARKING	Digital Input (12Vdc)	Stop marking external command (12Vdc pulsed signal)
14	CODE3	Digital Input (12Vdc)	Free input 3 (INPUT 12)
15	CODE2	Digital Input (12Vdc)	Free input 2 (INPUT 11)
16	CODE1	Digital Input (12Vdc)	Free input 1 (INPUT 10)
17	END_MARKING	Open-collector digital output (max 200mA)	End marking signal (active at the end of marking) (Closed = ON ; Open = OFF)
18	LASER_ACTIVE	Open-collector digital output (max 200mA)	Laser source is enabled (KEY is on) (Closed = ON ; Open = OFF)
19	GND	GND	GND reference
20	SYSTEM_ALARM	Open-collector digital output (max 200mA)	Main Alarm Signal (system is ready/not ready to mark) (Closed = System Error ; Open = System Ready)
21	GND	GND	GND reference
22	SHUTTER_OPEN	Open-collector digital output (max 200mA)	Shutter Status Signal (active when open) (Closed = Shutter Open ; Open = Shutter Closed)
23	SW_READY	Open-collector digital output (max 200mA)	Software Ready (active when laser engine is loaded) (Closed = SW Ready ; Open = SW NOT Ready)
24	GND	GND	GND reference
25	GND	GND	GND reference

TABELLA 1: Pin-out Command Box connector.

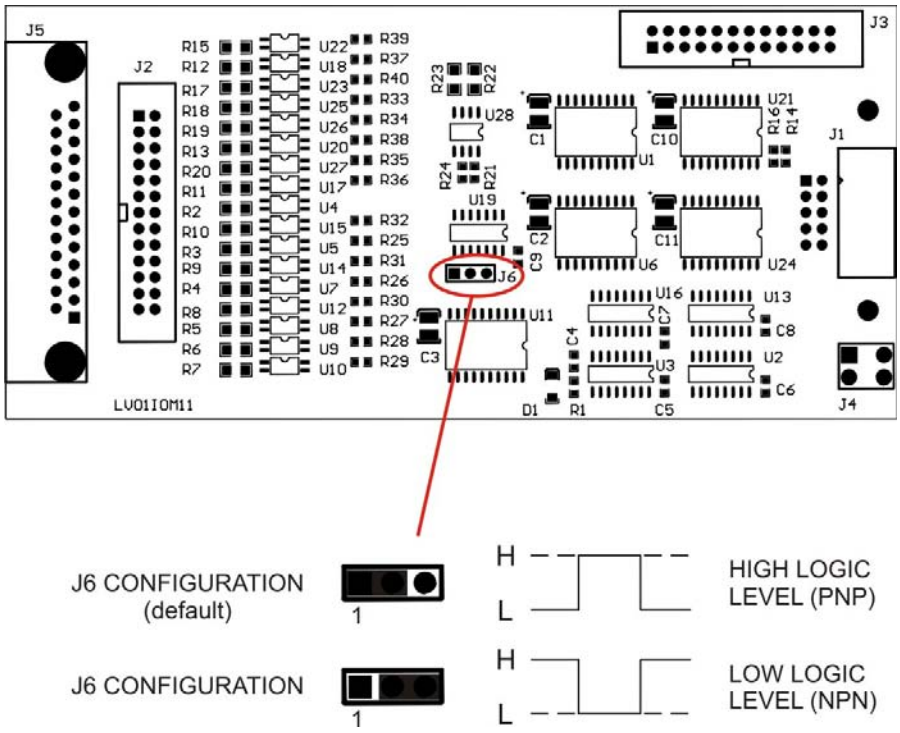


Figure 36: START_MARKING signal logic configuration.

4.1.6 TIMING DIAGRAM COMMAND BOX LASER SIGNALS

4.1.6.1 Normal operation (Automatic mode)

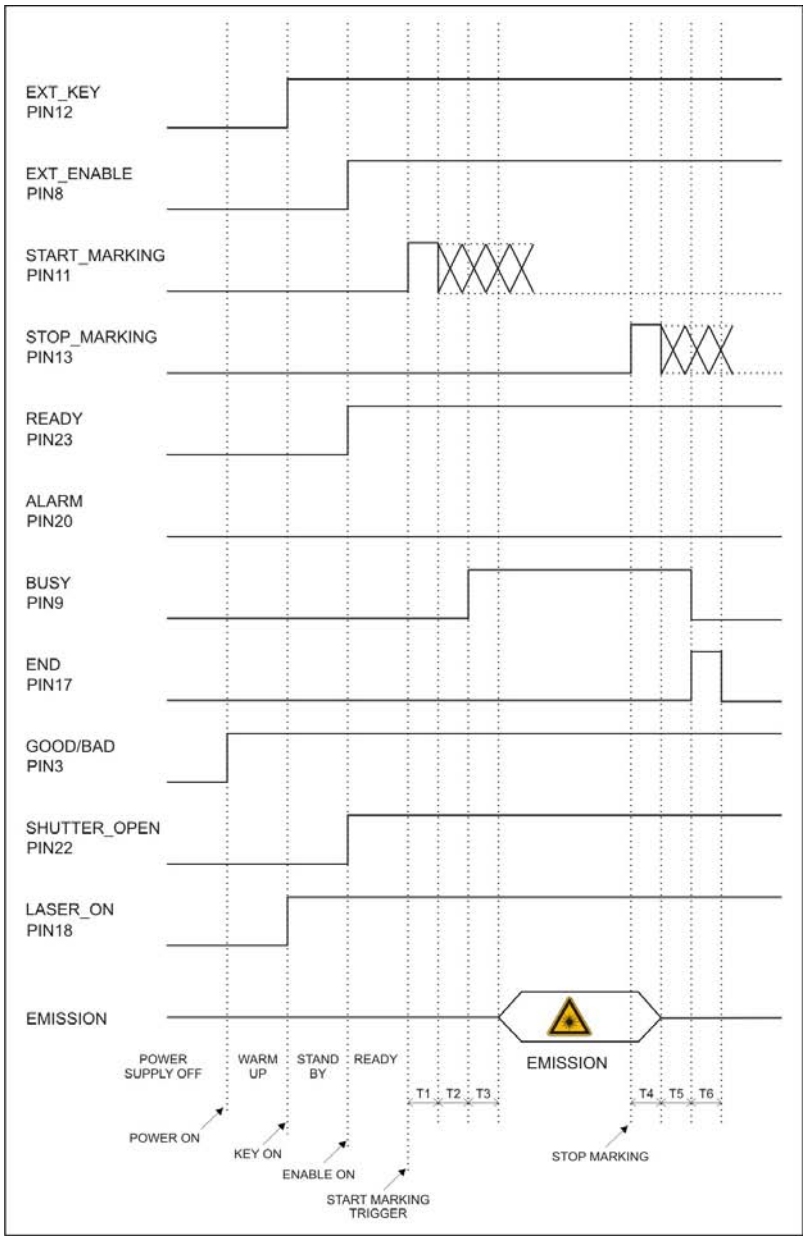


Figure 37: Timing signals (normal operation)

The time intervals in the diagram can all be programmed by a resolution of 1 ms.

T_1	Start Time	For setting the minimum acceptable time for the start engraving signal
T_2	Start Delay	For delaying engraving start
T_3	Busy Advance	Busy signal corresponding to mark progress
T_4	Stop Time	The minimum time for stop signal to stop the marking process
T_5	End Delay	For delaying the Laser End signal with respect to laser emission
T_6	End Time	For setting the Laser End activation time.

NOTE:

The **READY** signal is active in the following cases:

- document or sequencein AUTO mode, KEY ON, ENABLE active
- script in AUTO mode and activation with “IoPort.setReady (true)”. Disable with “IoPort.setReady (false)”

4.1.6.2 Fault event (Automatic mode)

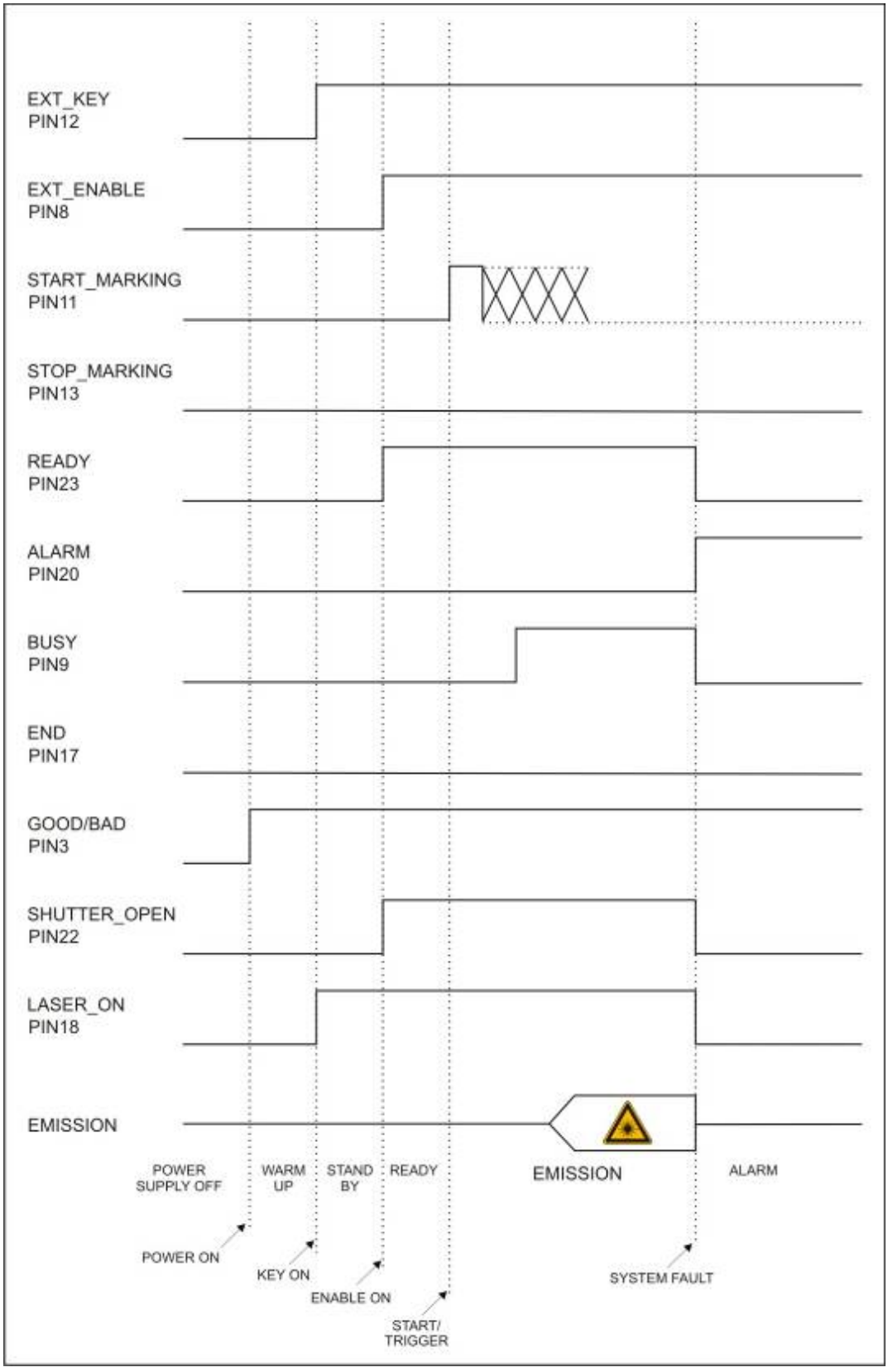


Figure 38: Timing signals (fault event)

4.1.6.3 Marking Error event (Automatic mode and MOF enabled)

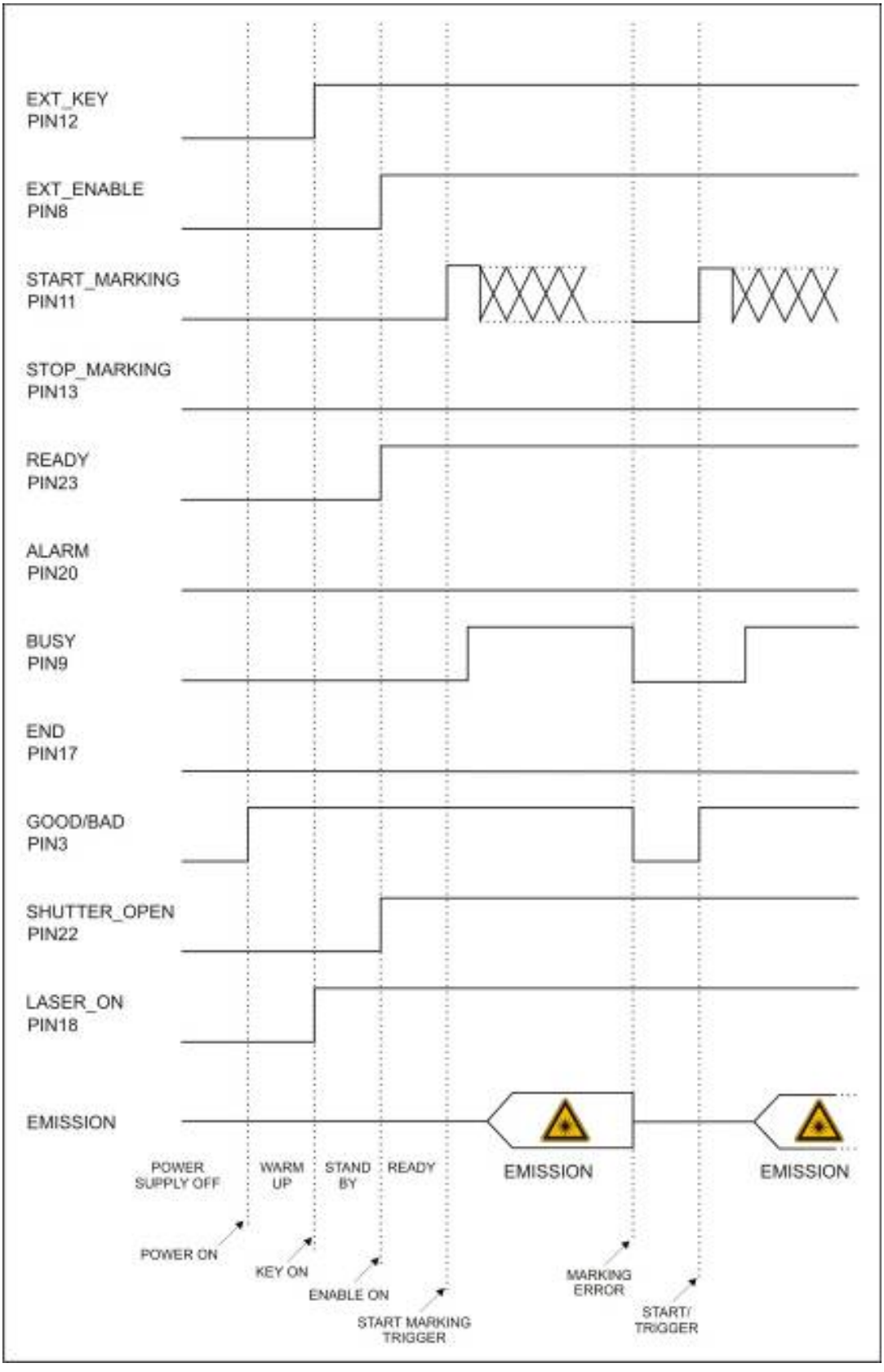


Figure 39: Timing signals (marking error event)

4.1.7 AXES CONNECTOR (I/O CONTROL)

Panel socket SUB-D, 25-way, male. This connection is used to manage external moving axes control.

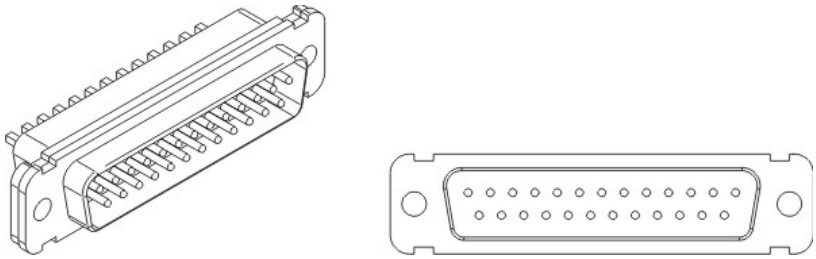


Figure 40: Male panel socket SUB-D 25 (frontal view).

PIN	SIGNAL	TYPE	DESCRIPTION
1	EXT_P12V	Output Power supply	12VDC output supply (max 1A)
2	OUTPUT 0 or STEP Y	Open-collector digital output (max 200mA)	Y-Axis drive step signal (Clock) for axes control or generic output
3	OUTPUT 2 or STEP Z	Open-collector digital output (max 200mA)	Z-Axis drive step signal (Clock) for axes control or generic output
4	OUTPUT 4 or BRAKE X	Open-collector digital output (max 200mA)	X-Axis Electromechanical brake release signal (if fitted). Active during drive motion or generic output
5	OUTPUT 6 or BRAKE Y	Open-collector digital output (max 200mA)	Y-Axis Electromechanical brake release signal (if fitted). Active during drive motion or generic output
6	OUTPUT 8 or BRAKE Z	Open-collector digital output (max 200mA)	Z-Axis Electromechanical brake release signal (if fitted). Active during drive motion or generic output
7	INPUT 0 or ZERO X	Digital Input (12Vdc)	Mechanical zero sensor. The X-Axis reference mechanical zero search is stopped when this signal is activated (positive voltage) or generic input
8	INPUT 1 or ZERO Y	Digital Input (12Vdc)	Mechanical zero sensor. The Y-Axis reference mechanical zero search is stopped when this signal is activated (positive voltage) or generic input
9	INPUT 2 or ZERO Z	Digital Input (12Vdc)	Mechanical zero sensor. The Z-Axis reference mechanical zero search is stopped when this signal is activated (positive voltage) or generic input
10	INPUT 3 or DISABLE X	Digital Input (12Vdc)	X-Axis disable signal. When active, the corresponding step signal remains in the status prior to activation or generic input
11	INPUT 4 or DISABLE Y	Digital Input (12Vdc)	Y-Axis disable signal. When active, the corresponding step signal remains in the status prior to activation or generic input
12	INPUT 5 or DISABLE Z	Digital Input (12Vdc)	Z-Axis disable signal. When active, the corresponding step signal remains in the status prior to activation or generic input
13	PGND	Ground	Ground ref. for Power Supply
14	OUTPUT 12 or STEP R	Open-collector digital output (max 200mA)	R-Axis drive step signal (Clock) for axes control or generic output
15	OUTPUT 1 or STEP X	Open-collector digital output (max 200mA)	X-Axis drive step signal (Clock) for axes control or generic output
16	OUTPUT 3 or DIR Z	Open-collector digital output (max 200mA)	Z-Axis drive direction signal or generic output
17	OUTPUT 5 or DIR Y	Open-collector digital output (max 200mA)	Y-Axis drive direction signal or generic output
18	OUTPUT 7 or DIR X	Open-collector digital output (max 200mA)	X-Axis drive direction signal or generic output
19	INPUT 9	Digital Input (12Vdc)	Generic free fast Input
20	INPUT 8	Digital Input (12Vdc)	Generic free fast Input
21	INPUT 7 or ZERO R	Digital Input (12Vdc)	Mechanical zero sensor. The R-Axis reference mechanical zero search is stopped when this signal is activated (positive voltage) or generic input
22	INPUT 6 or DISABLE R	Digital Input (12Vdc)	R-Axis disable signal. When active, the corresponding step signal remains in the status prior to activation or generic input
23	OUTPUT 9 or BRAKE R	Open-collector digital output (max 200mA)	R-Axis Electromechanical brake release signal (if fitted). Active during drive motion or generic output
24	DIR R	Open-collector digital output (max 200mA)	R-Axis drive direction signal
25	PGND	Ground	Ground ref. for Power Supply

4.2 MAINTENANCE

The ordinary maintenance program foresees only. Some operations consist in a mere “check” of the operating condition.

The maintenance activities must be done in respect of law prescriptions regarding the safety rules during the operations.

The following parts/functions have to be controlled:

MAINTENANCE PROGRAM

COMPONENT OR FUNCTION	TYPE OF OPERATION	INTERVALS
Laser Output	Check	Weekly: rub gently with a cloth tampered with acetone or ethyl ether
Fan and heat exchanger unit	Check	Every 6 months (according to the place and frequency of use)

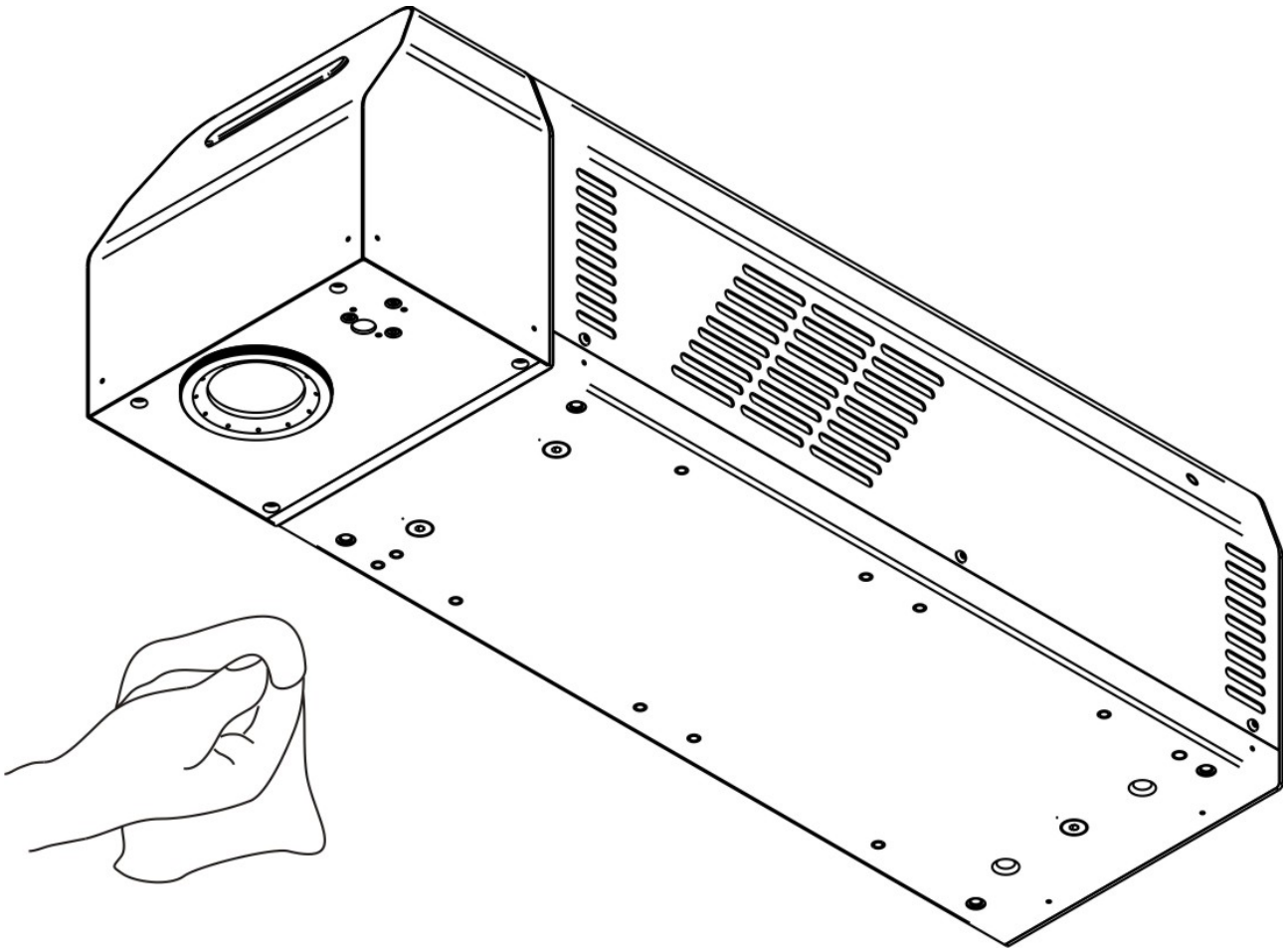
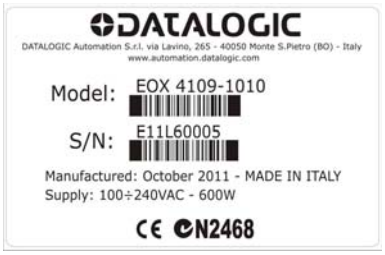


Figure 41: Cleaning laser output.

APPENDIX A: LABEL IDENTIFICATION

LABEL	DESCRIPTION
	**Identification label.**
	Warning logotype.
	Laser label.
	Aperture label.
	Electric warning label.
	Interlock label.
COMMAND BOX	**Command Box connector.**
AXES	**Control Axes connector.**
INLET AIR	**Inlet air.**
USB	**USB plug.**
LAN	**LAN connector.**

RS232	**RS232 connector.**
VGA	**VGA connector.**
KEYB	**Keyboard connector.**
PHOT	**Photocell connector.**
ENC	**Encoder connector.**

POSITIONING OF EXTERNAL LABELS

Positioning of labels:

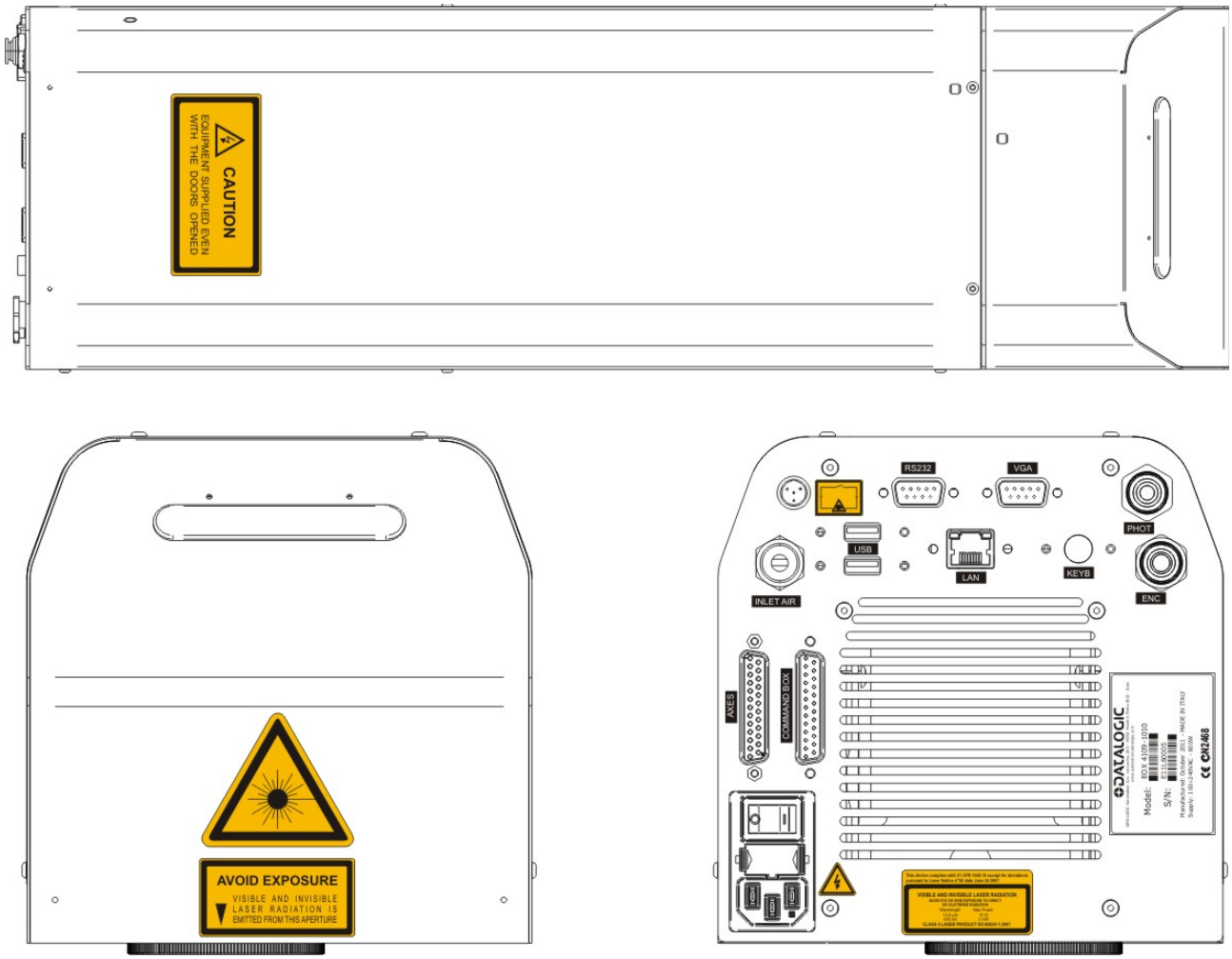


Figure 42: External labels.

APPENDIX B : STANDARDS

LASER STANDARDS

Eox 10W is designed to complies with the applicable sections of these laser standards:

EU : EN60825-1
USA : 21 CFR 1040.10

Eox 10W is classified as Class 4 Laser Product.

Datalogic Automation S.r.l., as manufacturer of "Eox 10W" laser sources, provides a laser device which is NOT intended for immediate use, but it must be connected, by others, to other devices which have the final aim of creating a laser processing system.

The system manufacturer MUST ensure the safety of the laser processing machine according to its standards including the risk-analysis, implementation of safety measures, certification and testing of safety measures and the production of adequate information for use of the machine.

Datalogic Automation S.r.l. is available for providing to the system integrator/OEM all the information in its possession to help in complying with applicable standards

CE COMPLIANCE

See Declaration of Conformity.

WARNING!
This is a Class A product. In a Class B environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC COMPLIANCE

Modifications or changes to this equipment without the expressed written approval of Datalogic could void the authority to use the equipment.

This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference which may cause undesired operation.

This equipment has been tested and found to Comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

APPENDX C : GUIDE FOR SYSTEM INTEGRATOR

Eox 10W is classified as Class 4 Laser product. It is intended to be installed in a system by system integrator/OEMs that they have the final responsability of Classification of their end product.

Final system MUST complies with all requirements in order that the system will be classified as

- CLASS 1 LASER PRODUCT if end user could be exposed to a radiation not exceed the AEL for Class 1 during marking operation (10.6 µm)

- CLASS 2 LASER PRODUCT if end user is not exposed to a radiation during marking but could be exposed to the radiation not exceeding the AEL for Class 2 during focusing and aiming (635nm)

Eox 10W is designed to easily fulfil all the requirement as per EU/USA standards.

Below a YES/NO table for features of Class 4 Laser. A "NO" in the Eox 10W column means that the feature is available through dedicated connector and MUST be completely implemented by the system integrator/OEM.

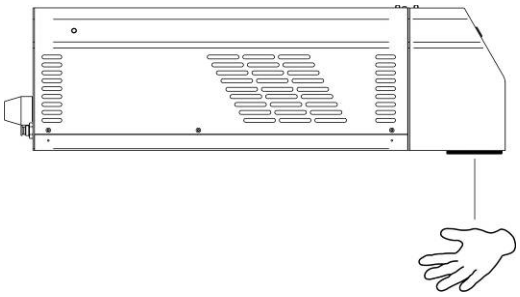
FEATURE	LOCATION/DESCRIPTION	CDRH	EN60825-1	EOX 10W
Keyswitch	Located on the command box connector. It turns on the laser source when activated	YES	YES	YES
Shutter Function	Located on the command box connector. When enabled open the safety mechanical shutter after the laser source	YES	YES	YES
Power indicator	Led bar front panel (green): Illuminates green to indicate that system is in standby mode	NO	NO	YES
Ready Indicator	Led bar front panel (yellow): Indicates that the system has power applied, shutter is open and is capable of lasing	YES	YES	YES
Laser on indicator	Led bar front panel (red): Indicates that the laser is actively lasing	YES	YES	YES
Five seconds delay	Internal circuit elements: disables RF driver/laser output for five seconds after Laser Enable signal is applied	YES	NO	YES
Power fail lockout	Internal circuit elements: disables laser output if input power is removed then later reapplied (AC power failure or remote interlock actuation) while Keyswitch is in “On” position.	YES	NO	YES
Remote Interlock	Rear panel connection: disables laser output when a remote interlock switch on an equipment door or panel is opened	YES	YES	YES
Over temperature protection	Internal circuit element: temperature shutdown occurs if temperature of the laser tube rises above safe operating limits	NO	NO	YES
Warning labels	EOX exterior: labels attached to various external housing locations to warn personnel of potential laser hazard	YES*	YES	YES

* Eox 10W labels comply with Class 4 Laser Product Requirement. The labels to be used in the machine where Eox is installed MUST comply with the requirements for the Laser Class of the machine itself.

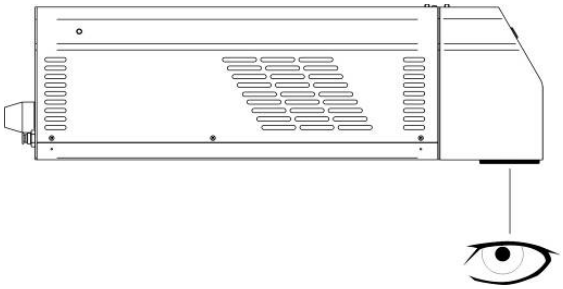
APPENDIX D: NOTE ABOUT LASER

LASER SAFETY

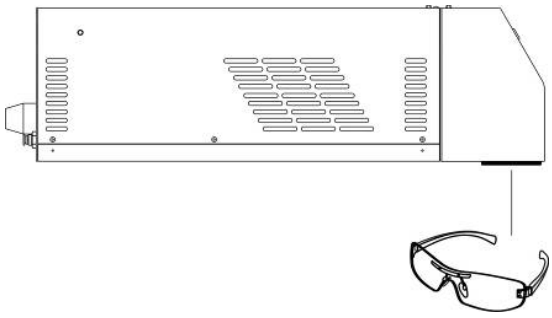
The following information is provided in compliance with regulations set by International Authorities, and it refers to proper use of Eox 10W.



NOTE:
It is crucial that you protect yourself against beams of reflected or direct light as they cause permanent damage to your skin.



NOTE:
Staring directly at a laser beam may cause irreversible damage to your eyes.



NOTE:
Wear safety goggles while using the machine!

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE APPENDIX CONCERNING **LASER SAFETY**.

NOTE:

The EOX system is designed for the processing of non-flammable materials.

Infrared laser radiation carries very high energy: **FIRE HAZARD!**

Do not direct the laser beam at flammable materials (paper, wood, containers filled with flammable liquids, etc.) without taking suitable precautions (inert gas, etc.).

Do not direct the laser beam at sloping surfaces as there is a risk of reflection.

Keep solvents and flammable materials away from the laser source. Avoid the accumulation of combustible vapours.

NOTE:

When marking materials using CO_2 laser radiations, decomposition products may form which are harmful to man's health.

The vaporization of certain materials may generate ultra-fine dust and vapors containing carbonization products which are harmful to man's health.

We **strongly** recommend installing an adequately sized extraction system equipped with filters suited to the dust and fumes to be extracted.

Certain processes may generate fumes and vapors of such density that they cause the extraction system to become totally ineffective in a very short time.

Periodically check for proper operation of the extraction system.

NOTE: Zinc selenide

The **EOX** device uses a special focusing lens (mounted on the scanning head) in Zinc Selenide (ZnSe).

When broken down to dust and fragments, this material is toxic for man's health if inhaled, swallowed or in case of eye contact.

There are no health hazards under normal operating and maintenance conditions.

Do not scratch the lens while cleaning it.

In case the lens breaks, wear protective gloves and clean up all lens pieces, putting them in a sealed bag to be sent back to Datalogic Automation Srl.

Please turn to the appendix for the safety data sheet on ZnSe.

LASER RADIATION

Laser radiation is an electromagnetic emission with a micrometric wavelength which ranges from the long infrared (CO_2 Laser), close infrared (Nd Laser: Yag, Nd: YVO4), visible (He Laser: Ne or Argon) and ultraviolet (excimer laser).
It should be considered non-Ionizing Radiation. In Eox 10W lasers the emission is generated by CO_2 tube. The continuous reflection of Photons, between a front mirror and rear mirror, creates a positive reaction so that their number continues to increase, until reaching the concentration necessary to produce a beam which projects from the semi-reflecting front mirror. The radiation (which we can imagine as a “Beam of invisible light”) is then Collimated and Focalized with Lenses at a point where the intensity becomes high enough to be able to react with various materials producing an alteration in them due to thermal effect.
The radiations of Eox 10W laser are invisible and visible and the Eye receives it almost in its entirety without using the natural defense provided by pupil reflex! Added to this is the fact that it is generally very intense, with the result that it can be very harmful to the eye and present vision problems.

NOTE:
Directly viewing a Laser beam **can cause irreversible damage** to vision.

To prevent permanent damage to vision, a few precautions must be taken.
All individuals who may be exposed to dangerous levels of laser radiation, must know that the laser is active and wear protective goggles if necessary.

Due to its high power, the laser integrated in the Datalogic Automation system provokes reflected laser light from flat surfaces. Reflected light is potentially dangerous for the eyes and skin. Electromagnetic emission with a micrometric wave length is placed in long infrared, and is therefore invisible, thus it is not clear where reflected beams are aimed.

NOTE:
It is indispensable to protect yourself from reflected light beams, because they can be sufficiently intense to create permanent injury to the eyes or skin.

In addition to possible injury to the eyes or skin, direct laser emission can cause flammable materials to burn like organic solvents (alcohol, acetone) or gasoline and cause fabric and clothing to burn.

NOTE:
This laser is classified as **class 4**. Class 4 includes lasers which can produce risks, not only from **direct** or **reflected** radiation, but also from **scattered** radiation! The laser sources may be a significant risk for the skin and risk of burning flammable materials.

ABSORPTION OF LASER RADIATION

Human skin absorbs electromagnetic radiation in different ways depending on the wave length of the radiation. Both the eye and skin have a “predisposition” for accepting certain wave lengths, and are more unresponsive to absorbing others. In the specific case of the Eye, the Cornea and Crystalline lens let all the wave lengths from 400 to 1400 nm pass and reach the Retina, even with various attenuations. They include the range from visible light to IRA infrared. Therefore, one must immediately note that the radiation of laser Eox 10W, respectively with wavelength 10,6 µm, **involves the direct exposure of the Retina!**
In terms of the Skin, the “biological window” has different absorption percentages but is not dissimilar in terms of wave length. The maximum exposure values for Skin are much different compared to those tolerated by the Eye.

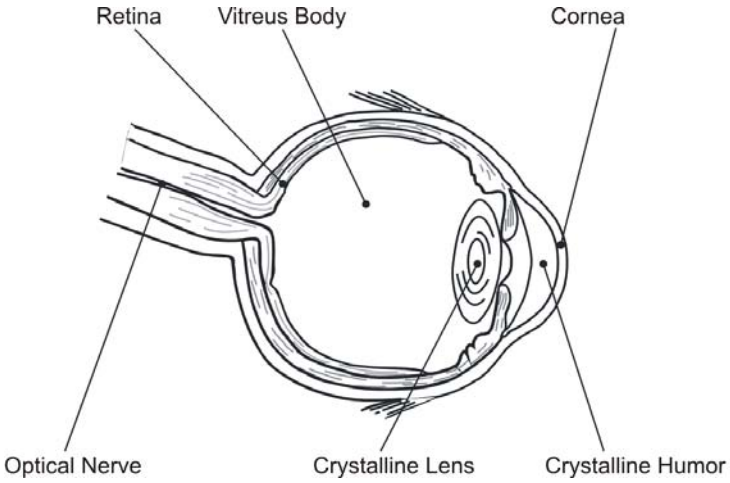


Figure 43: Eyeball section.

In terms of the damage mechanism that absorbed radiation can cause, it also depends on the wave length. Short lengths (ultraviolet: UV-C 180-280nm; UV-B 280-315 nm, UV-A 315-400 nm) generally cause photo-chemical effects:

- cataract, or opacification of the crystalline lens
- melanic coloring, or reddening of the skin

Greater wavelengths (infrared: IR-A 780-1400 nm; IR-B 1400 3000 nm; IR-C 3000-10^{E6} nm) generally cause thermal effects:

- detachment or photocoagulation of the retina
- burning of the skin

The degree of injury obviously depends on the **amount of absorbed radiation** and the **instantaneous power** of the radiation source.

CLASSIFICATION AND DANGER LEVEL

Regulations have established different classes of Laser danger based on the ability to injure people, from Laser class 1 (basically safe in all conditions) to Laser class 4 dangerous in various conditions.

Lasers which can produce risks, not only for direct or reflected radiation, but also for scattered radiation belong to class 4. These Laser sources can also have a significant risk for the Skin and fire risk for flammable material. For these reasons, the User must put into effect all measures aimed at containing the radiation to make sure that it is terminated at the end of its useful path. The operator must also be informed of the risks from exposure to Laser radiation and must wear specific I.P.D. (individual protection devices) including goggles that protect against radiation and are certified as suitable for this use.

NOTE:
The Eox 10W marker laser device contains a **class 4 invisible** source.

RADIATION VIEWING CONDITIONS

The Laser output by the resonator is to be considered as a highly collimated and intense monochromatic light source. Due to these characteristics it can be seen as a “punctiform source” of high luminosity. This means that its image is then focalized on the Retina in a very small spot with a dangerously high power density! If the beam becomes divergent and scatters to a non-reflecting screen, then there is an “extended vision” of the image, with a decisively less dangerous power density. So there are different types of radiation viewing based on the access to the radiation and consequently different degrees of dangerousness.

DIRECT VIEWING OF THE LASER BEAM

This type of viewing is the most dangerous and can occur at the outlet of the laser aperture after having removed the lens. It is to be avoided at all costs! No protective goggles represent a valid means against direct viewing of the beam.

DIRECT VIEWING OF THE BEAM AFTER MIRROR REFLECTION

This may occur by directing the beam on a reflecting surface.
Viewing of a mirror reflected beam from a flat surface is very dangerous and equal to direct viewing.

DIRECT VIEWING OF THE BEAM AFTER FOCUSING

This occurs if the Laser beam is not extinguished with an opportune absorber at the end of its useful path. Looking at the beam is dangerous up to a considerable distance. Filters and goggles can ensure safety for brief exposure, as long as they are the right size and certified.

SCATTERED VIEWING OF THE BEAM AFTER FOCUSING

This is the most frequent viewing, but opportune Filters and Goggles can ensure safety, even for prolonged exposure.
The Optical Risk Nominal Distance O.R.N.D. for Eox 10W are showed in the next paragraph.

NOTE:
Always use goggles with conformity certificate.
Remember that **no goggles can provide prolonged protection from direct or mirror-reflected radiation!**

EYES AND SKIN RISKS

If exposed to intense Laser radiation, even of a short duration, or a less intense but longer lasting duration, both the Cornea and the Retina can burn and be damaged irreparably forever. This consequence is completely realistic in the event of direct viewing of a class 4 Laser beam.

If subject to direct focalized radiation, even the skin can burn.

In addition, it is necessary to bear in mind that a collateral ultraviolet radiation may exist with the main radiation: long exposure may cause skin cancer.

GENERAL SAFETY REGULATIONS

The User must comply with the regulations and work in the best possible safety conditions to prevent decreasing the degree of machine safety. Therefore it is necessary to develop a Standard Operating Procedure (S.O.P.) related to maneuvers to effect for turning on and off the equipment. This procedure, which shall be prepared around the time of installation, shall serve as a reference for the Operator and shall be written in his/her language.

Training is essential and must include:

- Familiarization with system operating procedures.
- Knowledge of the biological effects of radiation on the Eyes and Skin.
- Understanding of the necessity for Individual Protection Devices (I.P.D.)

COLLATERAL RISKS

If the intended use of the source is changed, for example for material processing applications, collateral risks may arise represented by the production of fumes and vapors which may be irritating or toxic, if not removed and adequately filtered before being released into the air again.

NOTE:
It is advisable **not to change the intended use** without previously contacting the Manufacturer.

An additional risk may be represented by fire caused by processing materials other than those the equipment is designed for.

NOTE:
When processing **flammable material**, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned.

NOTE:
Do not subject **materials other** than those the equipment was designed for to radiation.

The most serious collateral risk associated with laser equipment, which may be fatal, is electricity.
This may occur when the manufacturer's warning and procedures are not followed. Unauthorized and untrained personnel must never do any work on the electrical part. The safety devices must never be removed and their operation must be periodically checked.

NOTE:
Do not work on the electrical part if you are not trained to do so. **Do not remove protection devices**.

NOTE:
When processing **flammable material**, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned.

For example, during the intended use of the Laser source, if a material being processed undergoes alterations and produces irritating and/or toxic fumes, it may be necessary to remove the fumes from processing before releasing them into the air.

An additional risk may be represented by fire caused by processing materials other than those the equipment was designed for.

NOTE:
Do not subject **materials other** than those the equipment was designed for to radiation.

NOTE:
When processing **flammable material**, such as plastic, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned and follow the instructions in the **SAFETY** Chapter, in the **Collateral Risks** section.

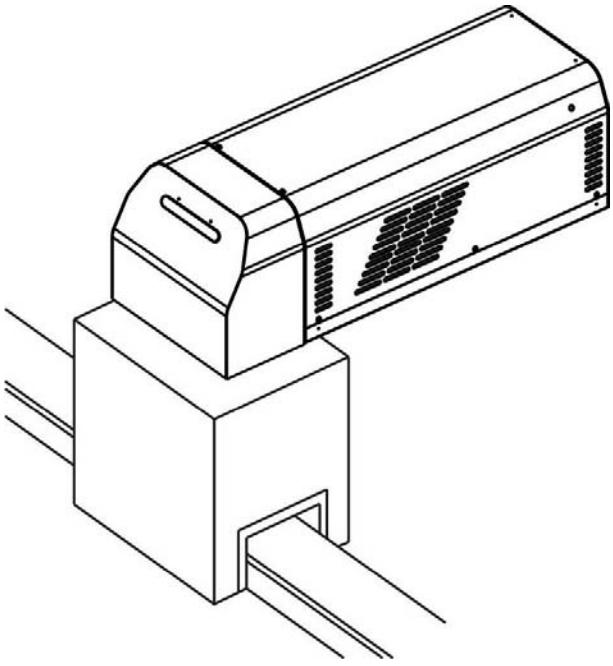


Figure 44: Safety mode example.

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